REPORT RESUMES

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THE PREPARATION OF CURRICULUM MATERIALS AND THE DEVELOPMENT OF TEACHERS FOR AN EXPERIMENTAL APPLICATION OF THE CLUSTER CONCEPT OF VOCATIONAL EDUCATION AT THE SECONDARY SCHOOL LEVEL. VOLUME III, INSTRUCTIONAL PLANS FOR THE METAL FORMING AND FABRICATION CLUSTER.

BY- MALEY, DONALD
MARYLAND UNIV., COLLEGE PARK

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DESCRIPTORS- *OCCUPATIONAL CLUSTERS, *METAL WORKERS, *CURRICULUM GUIDES, *TEACHING GUIDES, *TRADE AND INDUSTRIAL EDUCATION, GRADE 11, GRADE 12,

DESIGNED FOR USE WITH 11TH AND 12TH GRADE STUDENTS, THIS CURRICULUM GUIDE FOR THE OCCUPATIONAL CLUSTER IN METAL FORMING AND FABRICATION WAS DEVELOPED BY PARTICIPATING TEACHERS FROM RESULTS OF THE RESEARCH PROCEDURES DESCRIBED IN VOLUME I (VT 004 162). THE COURSE DESCRIPTION, NEED FOR THE COURSE, COURSE OBJECTIVES, PROCEDURES AND INSTRUCTIONAL PLAN ARE DISCUSSED BRIEFLY. THE TASKS AND HUMAN REQUIREMENTS ARE ARRANGED IN AN INSTRUCTIONAL SEQUENCE FOR EACH OCCUPATION INCLUDED IN THE METAL FORMING AND FABRICATION CLUSTER--ASSEMBLY, MACHINING, SHEET METAL WORK, AND WELDING. SUGGESTED TEACHING METHODS, INSTRUCTIONAL MATERIALS, STUDENT ACTIVITIES, AND EVALUATION PROCEDURES ARE ARRANGED IN COLUMNS OPPOSITE EACH AREA OF HUMAN REQUIREMENT. AN INSTRUCTIONAL MATERIALS LIST OF BOOKS, FILM, FILMSTRIPS AND CHARTS IS INCLUDED. VOLUME II, INSTRUCTIONAL PLANS FOR THE CONSTRUCTION CLUSTER (VT 004 163) AND VOLUME IV, INSTRUCTIONAL PLAN FOR THE ELECTRO-MECHANICAL INSTALLATION AND REPAIR CLUSTER (VT 004 165) COVER THE OTHER TWO OCCUPATIONAL CLUSTERS THAT WERE DEVELOPED BY THE PROJECT. (MM)

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FINAL REPORT
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THE PREPARATION OF CURRICULUM MATERIALS AND THE DEVELOPMENT OF TEACHERS FOR AN EXPERIMENTAL APPLICATION OF THE CLUSTER CONCEPT OF VOCATIONAL EDUCATION AT THE SECONDARY SCHOOL LEVEL

Volume III

Instructional Plans for the Metal Forming and Fabrication Cluster

August 1967

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Dr. Donald Maley

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Industrial Education Department
University of Maryland
College Park, Maryland

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INTRODUCTION

The volume for the occupational cluster of metal forming and fabrication is the result of the research procedures which are described in Part III of the final report volume. The instructional plans for the cluster were developed by the teachers participating in the program. Each teacher selected one of the occupations in the cluster and developed an instructional plan based on the tasks and areas of human requirement identified during the first phase of the project. The areas of human requirement are arranged in a suggested instructional sequence for each task in the occupation. The teaching methods, instructional materials, student activities, and methods of evaluation were then identified for each area of human requirement.

COURSE DESCRIPTION: The instructional plan for the occupation cluster of metal forming and fabrication is designed to be used in a cluster concept program in vocational education at the secondary school level. The program is aimed at the development of skills and understandings related to a group of occupations within the metal forming and fabrication cluster. It is not an in-depth development into any one occupation, but aims at preparing students to enter a number of occupations within the fabrication cluster.

NEED FOR THE COURSE: The course is designed to meet the needs of students pursuing a general curriculum in the secondary school system by providing job entry skills in a number of related occupations. It is also designed to meet the student's need for self appraisal of interests and potentialities in a number of occupations.

Specific needs include the following:

1. To provide students with the opportunity for a greater degree of mobility on a geographical basis.
2. To provide students with the opportunity for mobility within an industry or occupation.
3. To provide students with the opportunity for greater flexibility in occupational choice patterns.

COURSE OBJECTIVES: The course for the metal forming and fabrication cluster will be directed toward the following objectives:

1. To broaden the student's knowledge of the available opportunities in occupations found in the metal forming and fabrication cluster.
2. To develop job entry skills and knowledge for several occupations found in the metal forming and fabrication cluster.
3. To develop a favorable attitude toward work in the metal forming and fabrication cluster.
4. To develop a student's insight into the sources of information that will be helpful to him as he moves through the occupational areas.

The specific objectives for the course are the following:

1. To develop the student's competency in the use of common hand tools found in the metal forming and fabrication cluster.
2. To develop the student's competency in using power tools and equipment needed for job entry into the occupations found in the metal forming and fabrication cluster.
3. To develop the student's understanding of the operations, procedures, and processes associated with the metal forming and fabrication cluster.
4. To develop safe working habits related to the occupations within the metal forming and fabrication cluster.

5. To familiarize the student with the terminology associated with the metal forming and fabrication cluster.

6. To develop an understanding of the resources available to him in his pursuit of the course as well as in his work following graduation.

PROCEDURE: It is recommended that the course be offered during the student's junior and senior year in high school. Instruction should be provided for two periods a day, five days a week,during the school year.

The most appropriate facility would be a self-contained laboratory unit containing the essential tools and equipment necessary for teaching job entry tasks in the metal forming and fabrication cluster.

The instructor should be a person with some experience and competence in the occupations included in the cluster. The course should be organized by the teacher on a multiple acitvity basis with groups of students rotating through the specific occupational areas. The common areas of human requirement needed to perform the tasks in the cluster should be emphasized so that an opportunity is provided for the students to transfer the common skill or knowledge from one occupation to another.

The possibility of team teaching procedures would be appropriate for the metal forming and fabrication cluster. Specialists in different occupational areas would participate in the instructional program. The team teachers could be other vocational teachers as well as competent individuals from the community.

The instructor of the course should coordinate his program with other teachers in the school to develop the competencies in mathematics, science, and communication that will be needed for successful performance in the occupations found in the metal forming and fabrication cluster. Community resources, such as local industries, employment agencies, and tradesmen should be utilized to provide occupational information and knowledge needed concerning the performance of the tasks in the metal forming and fabrication occupations.

INSTRUCTIONAL PLAN: The following section of the volume presents the instructional plan for the metal forming and fabrication cluster. The tasks and areas of human requirement are arranged in an instructional sequence for each occupation. Suggested teaching methods, instructional materials, student activities, and evaluation procedures are found opposite each area of human requirement. Instructional plans for occupational information are found at the end of each occupation. The plan sheets in the volume provide teachers with the information needed to implement a metal forming and fabrication cluster concept program at the secondary school level.

ASSEMBLY

TASK NO. 1: ADHERING PARTS WITH ADHESIVES USING HAND PROCESSES TO PRODUCE A METAL BONDED ASSEMBLY

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading working drawing to determine: a. Adhesive to use b. Surfaces to be bonded	Lecture Using Overhead	Overhead Projector Transparency of blueprint	Watching screen as teacher elaborates. Assignment: Reading unit #2, Modern Metalworking, Walker, pp. 21-26.	Oral questioning. Written quiz.
Applying knowledge of weight and volume for mixing adhesives.	Lecture 1. Ratio 2. Proportions	Scale Adhesive constituents	Working related problems. Extra Credit: Writing to various manufacturers of adhesives for information regarding the correct mixtures of their products.	Check problems worked.
Calculating proportions of components of adhesive according to specifications.	Lecture 1. Weight 2. Volume	Adhesive constituents Scale Measuring containers	Working problems of various quantities of adhesives to be mixed to various specifications.	Check problems.
Cleaning surfaces to be bonded with appropriate cleaning method: a. Chemical or acid bath b. Abrasive	Demonstration	Chemical bath facilities Acid bath facilities Emery Cloth Sand Paper	Practice cleaning surfaces according to instructor's directions.	Observation.
Setting up metal assembly for bonding	Demonstration	Jigs Clamps Fixtures	Practicing proper method of setting up assembly to prepare for bonding.	Observation.
Mixing adhesive compound according to procedure called for in specifications of the adhesive.	Demonstration using Overhead a. Method of mixing b. Ventilation	Overhead Projector Transparency of specifications (Teacher Made) Mixing Pot	Practicing mixing an adhesive according to directions.	Oral Questions Observation
Applying adhesive to area to be bonded with hand tools	Demonstration a. Thickness required b. Time lapse c. Safety d. Solvent	Materials to be bonded Brush	Practicing applying adhesvie to material.	Observation.
Clamping metal bonded assembly in a manner approprate to assembly and specifications of adhesive	Demonstration a. Pressure required b. Type of clamps c. Clamping time	Various clamps Assembly Parts	Clamping an assembly according to specifications and directions.	Observation.

Task No. I (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Cleaning hand tools used in applying adhesives with proper solvents.	Demonstration a. Type of solvent b. Method of removal	Brushes Solvents	Practicing cleaning tools according to directions.	Observation.
Removing clamping devices from bonded assembly.	Demonstration a. Curing time b. Method of Removal	Various Clamps Bonded assemblies	Practicing proper removal of clamps from assembly.	Observation.
Selecting appropriate hand tools for applying adhesive.	Lecture a. Brushes b. Rollers	Manufacturers Specifications Hand Tools	Practicing selecting proper tools for various types of applications.	Oral or written quiz.
Selecting adhesive to be used for the metal bond assembly according to blueprint	Lecture a. Strength of joint b. Length of time needed	Manufacturers Specifications Blueprint	Choosing the adhesvie best suited to fit various jobs to be done.	Check results.
Selecting appropriate clamping devices for assembly	Lecture a. Types of clamps best suited	Clamps Manufacturers Specifications (Clamping Pressure)	Choosing proper clamps for various types of assemblies.	Oral or written questions
Selecting appropriate mixing devices for assembly	Lecture a. Mixing pots	Mixing Pots Manufacturers' Specifications	Selecting mixing devices as recommended in specifications.	Oral or written questions
Practicing proper safety precautions as indicated on the specifications	Lecture a. Ventilation b. Skin Exposure	Manufacturers' Safety Precautions	Listing various safety regulations as recommended by various manufacturers.	Check results.

TASK NO. 2: ADHERING PARTS WITH ADHESIVES USING SPRAY EQUIPMENT TO SPECIFIED THICKNESS TO PRODUCE A METAL BONDED ASSEMBLY

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading working drawing to determine: a. Adhesive to use b. Surfaces to be bonded	Lecture Using Overhead	Overhead Projector Transparency of Blueprint	Watching screen as teacher elaborates. Assignment: Reading Unit #2, Modern Metalworking, Walker, pp. 2-1 - 2-6.	Oral Questioning Written Quiz
Applying knowledge of weight and volume for mixing adhesives	Lecture 1. Ratio 2. Proportions	Scale Adhesive constituents	Working related problems Extra Credit: Writing to various manufacturers of adhesives for information regarding the correct mixtures of their products.	Check Problems Worked
Calculating proportions of components of adhesive according to specifications	Lecture 1. Weight 2. Volume	Adhesive constituents Scale Measuring containers	Working problems of various quantities of adhesives to be mixed to various specifications.	Check problems
Cleaning surfaces to be bonded with appropriate cleaning method: a. Chemical or acid bath b. Abrasive	Demonstration	Chemical bath facilities Acid bath facilities Emery cloth Sand Paper	Practice cleaning surfaces according to instructor's directions	Observation
Setting up metal assembly for bonding	Demonstration	Jigs Clamps Fixtures	Practicing proper method of setting up assembly to prepare for bonding.	Observation
Mixing adhesive compound according to procedure called for in specifications of the adhesive	Demonstration using Overhead a. Method of mixing b. Ventilation	Overhead Projector Transparency of specifications (Teacher Made) Mixing Pot	Practicing mixing an adhesive according to directions.	Oral Questions Observations
Filling spray chamber with adhesive	Demonstration a. Method b. Safety	Spray Gun Mixed Adhesive	Practicing proper method of filling spray chamber with adhesvie according to instructors directions.	Observation.
Adjusting spray gun for proper spray density	Demonstration a. Proper Air Pressure b. Proper air adhesive ratio	Spray Gun Adhesive Parts for trial assembly	Experimenting with spray gun to establish correct density.	Observation.

Task No. 2 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Spraying metal surfaces with adhesive spray gun to produce a metal bonded assembly	Demonstration a. Thickness (mils)	Manufacturer's Specifications Spray Gun	Practicing spraying metal surfaces according to instructors demonstration.	Observation.
			Contacting industries both local and otherwise to find where adhesives are most widely used.	Oral or written questions.
Clamping metal bonded assembly in a manner appropriate to assembly and specifications of adhesive	Demonstration a. Pressure required b. Type of clamps c. Clamping time	Various clamps Assembly parts	Practicing cleaning spray gun as to directions of the teacher.	Observation.
Cleaning spray chamber with appropriate solvent	Demonstration a. Ventilation b. Solvent	Spray Gun Solvents	Practice cleaning spray chamber.	Observation
Removing clamping devices from bonded assembly	Demonstration a. Curing time b. Method of Removal	Various Clamps Bonded Assemblies	Removing clamping devices from bonded assembly.	Observation

TASK NO. 3: FASTENING METAL PARTS WITH SCREW TO PRODUCE AN ASSEMBLY

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprints to determine size and number of screws to be used	Prepare and distribute sufficient prints for each class member Discuss the print pointing out details that illustrate the size, type, and number of screws	Blueprints Screw Charts	Read and study blueprint while instructor explains.	Verbally asking various class members questions to determine the extent of understanding.
Selecting correct screws to be used for type and thickness of metal to be assembled	Using charts, showing kinds and sizes of screws, discuss the design and use of each type A. Kind of screw I. Type of thread II. Type of finish B. Size I. Diameter II. Length C. Shape I. Shape of thread II. Shape of point (Setscrew)	Screw Charts (As available from industry or teacher made) Screws of all varieties	Reading unit #37, Metalwork Technology and Practice, Ludwig, pp. 269-272.	Written test, using "matching test" showing type of screw.
Tightening screws with a. Allen wrench b. Phillips-head screwdriver c. Standard screwdriver d. Offset screwdriver e. Hex wrench	Demonstration showing proper use of each a. Use b. Care c. Safety	Tools: At least one of each being discussed	Practicing proper way of using each tool. Assignment: Reading unit 16, Modern Metalworking, Walker, pp. 161-163.	Observe students in their use of the tools Oral or written quiz.
Selecting correct tools to be used for assembling with screws	Discuss importance of using the proper type and size of tool to do the the job properly	Tools: At least one of each being discussed Materials: Screws	Have students use several types and sizes of screws and choose and use the correct kind and size of tool.	Observe students

TASK NO. 4: BOLTING METAL PARTS WITH BOLTS TO PRODUCE AN ASSEMBLY

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprints to determine size and number of bolts to be used	Demonstration Pointing out where information is to be found	Materials: Blueprints Nut and bolt charts	Examining blueprint while the teacher explains where to find information.	Observing students
Tightening appropriate metal fasteners with: a. Adjustable wrench b. Torque Wrench c. Socket wrench (T-handle) d. Socket wrench (offset) e. Allen wrenches f. Socket wrench (ratchet) g. Open-end wrench h. Box-end wrench	Demonstration showing proper use of each type of wrench	Tools: At least one of each type of wrench being used. Materials: Safety Charts Film - Use and Care of Wrenches, Snap-On Corp.	Reading unit #15, Modern Metalworking, Walker, pp. 151-156. Practicing proper use of wrenches as explained by instructor.	Written test. Matching type test - matching wrench type with description. Observation.
Selecting correct tools to be used for assembling with bolts	Demonstration showing proper wrench used for various type bolt head	Materials: Chart showing wrench sizes for American Standard Bolts, Nuts, and Cop Screws. (Teacher Made)	Assembling various nut and bolt combinations to gain experience in choosing and using correct tool.	Observing students
Selecting correct bolts to be used for type and thickness of metal to be assembled	Explaining various kinds of bolts and uses a. Carriage bolts b. Machine bolts c. Tap bolts d. Stove bolts e. Stud bolts f. Cap Screws g. Machine screws h. Setscrews	Tools: Wrenches Materials: Examples of each bolt type Nut and Bolt Chart Metal parts of various characteristics to be assembled	Reading unit #37, Metal Work Technology and Practice, Ludwig, pp. 269-276. Assembling various parts to determine which bolts are best suited for which jobs.	Observing students in assembling procedure. Written test - match definition to sketch

TASK NO. 5: RIVETING METAL PARTS TO PRODUCE AN ASSEMBLY

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprints to determine size and number of rivets to be used	Explaining prints pointing out location of desired information	Materials: Blueprints	Reading various simple prints to gain experience in determining size and number of rivets used.	Asking questions verbally.
Riveting metal parts with power tools to produce an assembly	Demonstration	Tools: Power Riveting tool Materials: Metal parts to be riveted Rivets	Using power riveting tool; practice proper use.	Observation.
Removing rivets in assembly with a drift punch	Demonstration a. Drill head b. Remove head c. Punch out rivet	Center Punch Drill Drift Punch	Practicing removing rivet from assembly. Assignment: Reading unit #19, riveting, General Metals for Technology, Giachino, pp. 231-237.	Observation. Oral or written quiz.
Riveting metal parts with hand tools to produce an assembly	Demonstration	Tools: Ball Peen Hammer Rivet Set Riveting Block Materials: Safety Chart Rivets Metal parts to be riveted	Reading unit #36, Metal Work Technology and Practice, Ludwig, pp. 265 - 67. Riveting metal pieces together using handtools.	Observation.
Selecting correct riveting tool for the job a. Hand b. Power	Lecture a. Type of job b. Size of rivet	Tools: Ball Peen Hammer Rivet Sets Riveting Blocks Drift Punch Power Riveting Tool	Choosing the proper riveting tools to obtain proper results when doing various riveting jobs.	Observe results.
Selecting correct rivet to be used for type and thickness of metal to be assembled a. Types of rivets 1. Shape 2. Size 3. Material	Lecture a. Types of Rivets 1. Shape 2. Size 3. Material	Overhead Transparency (Teacher Prepared) showing method of figuring length of rivet Rivet Charts	Choosing the proper rivets to obtain proper results when riveting the various metals.	Observe results

TASK NO. 6: TIGHTENING METAL FASTENERS WITH HAND POWER TOOLS

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Mounting appropriate attachment to tighten or loosen metal fasteners	Demonstration a. Installing b. Tightening	Tools: Impact Wrench Power Screwdriver	Attaching and removing various kinds and sizes of attachments.	Observation.
Operating electric impact wrench to tighten or loosen metal fasteners	Demonstration a. Use b. Care c. Safety	Tools: Impact Wrench Sockets Materials: Nuts Bolts Washers Metal Parts of Assembly	Assembling and unassembling various parts using impact wrench.	Observation.
Tightening appropriate metal fasteners with a reversible electric impact wrench	Demonstration a. Use b. Care c. Safety	Tools: Reversible Impact Wrench Sockets	Practicing proper use of reversible impact wrench according to instructors directions.	Observation.
Selecting appropriate attachment to tighten or loosen metal fasteners	Demonstration	Tools: Sockets (Square and Hex) Screwdriver Blades Materials: Chart Showing sockets required in relation to bolt sizes	Selecting attachments to remove assorted fasteners	Observation
Practicing proper safety precautions	Lecture a. Eye Protection b. Hand Position	Safety Charts	Practice safe working habits	Written or observation

TASK NO. 7: MATING PARTS TOGETHER TO PRODUCE SUB-ASSEMBLIES

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprints (exploded view drawing) to determine relationship of detail parts to be mated	Demonstration: Explaining where to find needed information Explaining the way the exploded view shows the mating techniques	Blueprints Overhead Projector and Screen Examples of Sub-assemblies	Reading prints while teacher elaborates.	Asking verbal questions and having various class members point out their answer on the screen.
Aligining mated parts for assembly with an aligining punch	Demonstrate proper use of aligning punch	Punch Hammer Assembly Parts	Requiring each student to practice correct procedure.	Observation.
Mating parts to produce sub-assembly	Demonstration	Assembly Parts	Each student practicing proper alignment and mating of parts.	Observation.
Selecting mated parts for the sub-assembly	Lecture Demonstration	Assembly Parts	Selecting the proper parts in the proper sequence.	Observation.

TASK NO. 8: MATING PARTS AND SUB-ASSEMBLIES TOGETHER TO PRODUCE MAJOR ASSEMBLIES

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprints to determine relationship of details and sub-assemblies to produce major assemblies	Lecture (using overhead projector)	Overhead Projector Transparency of blueprint (Teacher Prepared)	Watching screen of overhead projector as teacher points out details.	Oral questions.
Mating parts and sub-assemblies to produce major assemblies	Demonstration a. Sequence	Parts and Sub-assemblies	Using parts and sub-assemblies, practicing proper mating of the parts to produce an assembly.	Observation.
Mating delicate parts with care	Demonstration	Parts to be mated.	Practicing mating delicate parts using precautions outlined by instructor.	Observation.
Selecting parts and sub-assemblies for mating	Demonstration a. Sequence Overhead	Overhead Projector Transparency (Teacher Prepared)	Selecting parts to be assembled as called for in prints.	Observation.

TASK NO. 9: HOLDING PARTS IN CLAMPING DEVICES FOR ASSEMBLY OF DETAILS, SUB-ASSEMBLIES, AND ASSEMBLIES

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Holding round stock or pipe in pipe vise	Demonstrate showing proper method of inserting and tightening round stock or pipe in pipe vise	Pipe Vise Round stock and pipe	Having each student practice inserting and tightening material in pipe vise. Assignment: Reading unit #13, Modern Metalworking, Walker, pp. 13-1 - 13-2.	Observation.
Holding work to bench with C-clamps	Explain and demonstrate proper way of clamping work to bench with C-clamps	C-clamps (Various sizes) Parts of Assembly Pamphlet: Clamps, Their History and Their Uses, The Cincinnati Tool Company	Practicing clamping stock in C-clamps as to instructions of teacher. Assignment: Reading Unit #2, Modern Metalworking, Walker, PP. 2-1 - 2-6.	Observation. Let students choose proper size C clamps to do a variety of operations and check for proper use.
Holding work in machinist's vise	Explain and demonstrate proper method of holding work in machinist's vise Explain use of vise caps	Machinist's vise Vise Caps	Practicing clamping work in a machinist's vise following instructor's directions. Assignment: Reading Unit #2, Modern Metalworking, Walker, pp. 2-1 - 2-6	Observation
Installing sub-assemblies in jigs and fixtures for assembly	Explain and show examples of jigs and fixtures Demonstrate proper method of installing parts in jigs and fixtures	Examples of jigs Examples of fixtures	Each student installing various sub-assemblies in jigs and fixtures following procedure outlined during demonstration Assignment: Reading Unit #2, Modern Metalworking, Walker, pp. 2-1 - 2-6	Observation
Mounting work in swivel vise	Demonstration showing manner in which the vise turns and locks Demonstrate proper method of tightening work in vise	Swivel Vise Examples of material to be mounted in vise	Each student fastening pieces of metal in vises and turning and locking the vise at various positions. Assignment: Reading Unit 13, Modern Metalworking, Walker, pp. 13-1 13-2.	Observation
Clamping work to appropriate tightness dependent upon the material and operation to be performed	Demonstrate the effects of having too little or too much tightening pressure on various material in different operations Discuss use of jaw caps	Various clamping devices Examples of materials Jaw Caps	Practicing tightening various materials to establish proper tightness	Oral questioning Observation
Selecting most appropriate vise for specific operation to be performed	Explain how the various clamps can be properly used for various oper operations	Overhead Projector Transparencies	Assignment: Reading Unit #13, Modern Metalworking, Walker, pp. 13-1 - 13-2.	Pencil and paper quiz. List several operations and have students name the vise which should be used
Selecting most appropriate clamps for specific operation to be performed	Explain how the various clamps can be properly used for various o operations	Teacher Prepared Chart showing list of clamps and appropriate applications	Assignment: Reading Unit #13, Modern Metalworking, Walker, pp. 13-1 - 13-2.	Pencil and paper quiz. List several operations and have students name the clamp which should be used

TASK NO. 10: CUTTING MATERIAL WITH HAND TOOLS TO FIT IN AN ASSEMBLY

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and Characteristics of the workpiece b. Type of cutting operation c. Finish and accuracy required d. Number of parts to be cut e. Kind of material	Demonstration Lecture using overhead	Tools: Scale Materials: Blueprints Transparency of blueprints (Teacher Made)	Examining blueprints while the teacher explains	Oral questions
Reading a scale to within 1/32 of an inch	Remedial lecture covering divisions and use of scale	Tools: Scale Overhead Projector Transparencies (Using overlays)	Practicing proper use as outlined by instructor	Check accuracy of students
Laying out stock with a: a. Square b. Rule or Scale c. Combination Square d. Dividers e. Trammel points f. Scriber	Demonstration showing proper use of layout tools if not already sufficiently covered	Tools: Square Rule Scale Combination Square Dividers Trammel Points Scriber Materials: Metal as needed Film: "Basic Layout Tools, 7 min., free, B. and W. United World Films, Inc.	Watching film Practicing, as needed, proper use of layout tools	Observation
Cutting appropriate materials with diagonal cutting pliers	Demonstration	Tools: Diagonal Pliers Materials: Various shapes and Kinds of metals Film Strip - Fundamentals of Benchwork, Film No. 1, Jam Handy Organization.	Practicing proper use	Observation
Cutting bolts, rods, and heavy wire with bolt cutter to 1/32 of an inch	Demonstration	Film Strip - Fundamentals of Benchwork, Film No. 1, Jam Handy Organization Bolt Cutters	Practicing proper use	Observation
Cutting metal (rivets, split nuts, ship castings, and thin sheets) with cold chisel to 1/32 of an inch	Film Demonstration showing proper use of various cold chisels in cutting different shapes and types of metal Discuss Safety	Tools: Cold Chisels a. Flat b. Cape c. Round Nose d. Diamond Point Film: "Care and Use of Hand Tools" - Part VI - "Metal Cutting Chisels" 5 min., Black and White, United World Films, Inc.	Watching film Practicing proper use	Paper and pencil quiz, including types and uses of chisels and safety factors involved

Task No. 10 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Cutting appropriate materials with side cutting pliers	Demonstration Video Tape	Film Strip: Fundamentals of Benchwork, Film No. 1, Jam Handy Organization. Side Cutting Pliers Video tape camera and recorder	Watching filmstrip and video tape monitor Practicing proper procedure	Observation
Cutting metal tubing with tubing cutter to produce two pieces to 1/32 of an inch	Demonstration Video Tape	Tubing Cutter Videotape Equipment	Practicing proper procedure	Observation
Cutting materials with combination pliers	Demonstration	Filmstrip: Fundamentals of Benchwork, Film No. 1, Jam Handy Organization Combination Pliers	Practicing proper procedure Watching filmstrip	Observation
Cutting material with hacksaw to 1/32 of an inch	Demonstration	Filmstrip: Fundamentals of Benchwork, Film No. 2, The Jam Handy Organization	Practicing proper procedures Watching filmstrip	Observation
Cutting materials with sheet metal snips (All Types) to 1/32 of an inch	Demonstration a. Use b. Care c. Safety	Tin Snips (All Types)	Practicing proper procedure Assignment: Reading Unit #39, Metalwork Technology and Practice, Ludwig, pp. 287-293.	Observation Oral or written quiz
Cutting material with various types of chisels	Demonstration a. Use b. Care c. Safety	Chisels (All Types)	Practicing proper procedure Assignment: Reading Unit #13, Metalwork Technology and Practice, Ludwig, pp. 99-103.	Observation Oral or written quiz
Removing burrs with: a. File b. Abrasive cloth	Demonstration	File Emery Cloth	Practicing proper procedure	Observation

TASK NO. 11: CUTTING MATERIALS WITH POWER TOOLS TO FIT IN AN ASSEMBLY TO 1/32 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece b. Size - drill bit c. Finish and accuracy required d. Number of parts to be cut e. Kind of material	Discuss print pointing out details (Remedial work)	Blueprints	Reading blueprints while teacher explains where to find information	Oral quiz
Applying knowledge of fractional parts of an inch a. Multiplying fractions to determine exact dimensions b. Adding fractions to determine exact dimensions c. Subtracting fractions to determine exact dimensions d. Dividing fractions to determine exact dimensions	Remedial lecture using actual figures from the print to figure dimensions	Blueprints Blackboard	Working with figures from the print to become efficient in their use	Paper and pencil test involving use of fractions
Laying out stock with a: a. Square b. Rule or Scale c. Combination Square d. Dividers e. Trammel Points f. Scriber g. Center Punch	Demonstration Reading Assignment	All Layout Tools mentioned Pamphlet	Reading - The Tools and Rules for Precision Measuring, pp. 1-22, L. S. Starrett Co.	Oral quiz
Cutting materials with sabre saw for assembly	Demonstration	Sabre Saw Metal Parts	Practicing proper use under supervision Collecting information regarding various sabre saws and attachments available	Observation
Cutting materials with a nibbler saw for assembly	Demonstration	Nibbler Saw Metal Parts	Practicing proper use under supervision Preparing a list of jobs requiring a nibbler saw	Observation
Sawing metal stock with hand hack saw to produce two pieces	Demonstration including: a. Blade selection b. Cutting Speed c. Proper Use d. Safety	Hacksaws Blades (Various Kinds and Sizes) Metals of various degrees of hardness, shape and size	Practicing various cuts following proper procedure outlined by instructor	Observation

Task No. 11 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting appropriate layout tools	Discuss as needed various layout tools for different jobs	Layout Tools	Assignment: Reading Unit #6, Modern Metalworking, Walker, pp 6-1 - 6-10.	Matching quiz - Identifying layout tools with the proper job to be done
Selecting appropriate power tool for the task	Discuss, as needed, which power tools are designed to do which jobs	Power Tools	Preparing a list of power tools and the jobs they can accomplish.	Quiz - Identify power tools with the proper job.
Practicing keeping hands away from cutting area	Safety Discussion	Safety Charts (Industry Provided and Teacher Made)	Preparing safety lists and charts for any assigned machine	Observation

TASK NO. 12: FILING STOCK TO PRODUCE A FINISHED ASSEMBLY TO .001 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Files material with different shaped files to produce a flat surface	Demonstration showing a. Various shaped files b. Proper Use c. Cleaning d. Safety	Chart (illustrations of files) Files File Handles File Card	Reading Assignment: Unit #17 Modern Metalworking, Walker, PP. 17-1 - 17-7.	Written test covering information in reading assignment
Files material with different shaped files to remove excess metal (deburrs)	Demonstration a. Use b. Care c. Cleaning d. Safety	Files Rough Metal Teacher Made Chart showing which files most appropriate for which materials	Practicing proper use under supervision	Observation
Selecting correct file shape, size, and type of material to be filed.	Lecture I. Shapes a. Flat b. Pillar c. Square d. 3-Square e. Knife f. Half-Round g. Crossing h. Round II. Kinds a. Machinist b. Mill c. Jeweler's d. Rasp e. Special Purpose	Overhead Projector (Teacher made of types of files)	Assignment: Reading Unit #2, Modern Metalworking, Walker, pp. 2-1 - 2-6. Preparing a list of files shapes and types and the jobs best suited for them	Oral or written questioning

TASK NO. 13: DRILLING HOLES IN MATERIAL WITH HAND DRILL TO PRODUCE A HOLE TO .005 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece to be drilled b. Type of operation c. Finish and accuracy required d. Kind of material	Discuss blueprint pointing out details (Remedial Work)	Blueprints	Reading prints while teacher explains	Oral quiz
Applying knowledge of fractional parts of an inch a. Multiplying fractions to determine exact dimensions b. Adding fractions to determine exact dimensions c. Subtracting fractions to determine exact dimensions d. Dividing fractions to determine exact dimensions	Lecture as needed to review use of fractions	Blueprints Blackboard	Remedial practice as needed	Written test
Applying knowledge of decimals: a. Adding decimals to determine exact dimensions b. Subtracting decimals to determine exact dimensions c. Multiplying decimals to determine exact dimensions d. Dividing decimals to determine exact dimensions	Lecture as needed to review use of decimals	Assignment sheet on decimals.	Solving assigned problems.	Written test
Laying out stock with a: a. Square b. Rule or Scale c. Combination Square d. Center Head e. Hemaphrodite Calipers f. Dividers g. Trammel Points h. Scriber i. Center Punch	Remedial lecture as needed on proper use of layout tools	Layout Tools Blueprints	Using layout tools, make variety of layouts for different circumstances Assignment: Choosing any layout tool from the task and doing research on it to determine origin, uses, etc.	Observation Check practice work for accuracy
Mounting drill bit in hand drill	Demonstration a. Inserting b. Tightening	Hand Drill Bits Film Strip - Fundamentals of Benchwork, Film No. 3, Drills and Drilling, The Jam Handy Organization	Practicing proper method of installing bit in hand drill	Observation
Drilling material with hand drill for assembly	Demonstration a. Use b. Care c. Safety	Drill Bits Stock	Drilling stock following procedure outlined by instructor	Observation Check accuracy of drilled hole in workplace

Task No. 13 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting hand drill most appropriate for task	Lecture	Hand Drill	Collect descriptive folders of various hand drills from suppliers and compare features for best performance of jobs. Assignment: Reading Unit #34, *Modern Metalworking*, Walker, pp. 34-1 - 34-24	Written quiz
Selecting drill bit size according to working drawing	Lecture on drill sizes 1. Letter 2. Number 3. Fractional	Drill Bits Drill Gauges Micrometer	Select bits and check their size using drill gauges and micrometer Assignment: Reading Unit #2, *Modern Metalworking*, Walker, pp. 2-1 - 2-6.	Check accuracy of student work Written quiz
Practicing keeping hands away from drilling area	Overhead Projector	Safety Overlay (Teacher Prepared)	Preparing charts listing safety precautions used when drilling	Oral questioning

TASK NO. 14: DRILLING STOCK WITH HAND POWER DRILLS TO PRODUCE A HOLE TO .005 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece to be drilled b. Type of operation c. Finish and accuracy required d. Kind of material	Lecture (Remedial as needed)	Blueprints	Read prints while teacher explains Obtaining prints from local industries to use as models for actual work problems	Oral or written questions
Applying knowledge of fractional parts of an inch: a. Multiplying fractions to determine exact dimensions b. Adding fractions to determine exact dimensions c. Subtracting fractions to determine exact dimensions d. Dividing fractions to determine exact dimensions	Remedial Lectures as needed	Prints	Using actual figures from prints, figure dimensions with the use of fractions	Written quiz
Applying knowledge of decimals: a. Adding decimals to determine exact dimensions b. Subtracting decimals to determine exact dimensions c. Multiplying decimals to determine exact dimensions	Remedial lectures as needed	Prints	Using figures from the prints, figuring actual dimensions with proper use of decimals	Written quiz
Laying out stock with a: a. Square b. Rule or Scale c. Combination square d. Center Head e. Hemaphrodite Calipers f. Dividers g. Trammel Points h. Scriber i. Center Punch	If not already sufficiently covered, demonstrate proper use of each layout tool	Examples of each tool being discussed	Using each of the tools to do various assigned layout jobs	Observation Check accuracy of work
Mounting drill bit in hand power drill	Demonstration a. Inserting b. Tightening	Hand Power Drill Drill Bit Chuck Key Film Strip: Fundamentals of Benchwork, Film No. 3, Drills and Drilling	Inserting and tightening various sizes of bits in hand power drill. Removing burrs from bits under direction of teacher.	Observation
Drilling materials with hand power drill for assembly	Demonstration a. Use b. Care c. Safety	Hand Power Drill Bits Chuck Key Eye Protective Device Cutting oil Overhead Projector	Drilling various types of metal with holes to within .001 of an inch following steps outlined by instructor.	Observation Check accuracy of drilled stock

Task No. 14 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting hand power drill most appropriate for the task	Lecture	Hand Power Drills Overhead Projector Transparency No. 1 Group No. 1 Portable Electric Tools - DCA Educational Products, Inc.	Assignment: Reading Unit #34, Modern Metalworking, Walker, pp. 34-1 - 34-24.	Oral or written test
Selecting drill bit size according to working drawing	Lecture 1. Number Sizes 2. Fractional Sizes 3. Letter Sizes	Drill Chart showing decimal equivalent of bit sizes	Selecting drill bits with the use of drill gauges and micrometer as to sizes required Assignment: Reading Unit #2, Modern Metalworking, Walker, pp. 2-1 - 2-6.	Check accuracy of bits selected by students
Practicing keeping hands away from drilling area	Safety Lecture Overhead	Safety Transparency (Teacher Made)	Preparing safety charts on safety precautions used when drilling	
			Practicing proper safety regulations in actual drilling	Observation

TASK NO. 15: REAMING STOCK WITH HAND WRENCH TO PRODUCE A FINISHED HOLE TO .001 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece b. Size of reamer required c. Finish and accuracy required d. Number of parts e. Kind of material	Discuss blueprint pointing out details (Remedial Work as Needed)	Blueprints	Reading blueprints while teacher explains	Oral questioning
Applying knowledge of decimals: a. Adding decimals to determine exact dimensions b. Subtracting decimals to determine exact dimensions c. Multiplying decimals to determine exact dimensions d. Dividing decimals to determine exact dimensions	Review lecture involving use of decimals in figuring dimensions	Blueprints	Practicing proper use of decimals in figuring dimensions	Written test
Mounting reamer in reamer wrench	Demonstration a. Inserting b. Securing	Reamers Two Handled Tap Wrench	Practicing proper method of mounting reamer as outlined in demonstration	Observation
Reaming drilled hole to produce a finished hole to .001 of an inch	Demonstrate Showing a. Pressure b. Cutting Direction c. Lubrication	Tap Wrench Reamers Lubricant Film Strip - Fundamentals of Benchwork, Film No. 4, Reaming, Tapping, and Threading, the Jam Handy Organization	Using drilled workpiece, ream different sized holes to specified tolerance	Check tolerance of workpiece
Selecting reamer wrench for the task	Discuss types, and sizes of wrenches and their uses	Tap Wrench	Assignment: Reading Unit #10, Modern Metalworking, Walker, pp. 10-1 - 10-3.	Written test
Selecting correct size reamer for the task	Discuss sizes of reamers and drill size in relation	Expansion Reamer Taper Reamer Adjustable Reamer (Straight and Spiral Flutes)	Choosing correct reamers to ream various size holes Assignment: Reading Unit #2, Modern Metalworking, Walker, pp. 2-1 - 2-6.	Observation Written Quiz

TASK NO. 16 COUNTERSINKING HOLE WITH HAND TOOLS TO PRODUCE A FASTENER RECEIVER HOLE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece b. Type of operation c. Finish and accuracy required d. Number of parts to be countersunk e. Kind of material	Lecture	Blueprints	Reading blueprints while teacher explains Collecting prints showing a variety of countersinking operations	Oral or written quiz
Mounting countersink in hand drill	Demonstration a. Removing burrs b. Inserting c. Tightening	Hand Drill Countersink Bits	Practicing proper method of mounting countersink in drill	Observation
Countersinking drilled hole with countersink in hand drill to produce a fastener receiver hole	Demonstration pointing out different methods for various fastener heads	Hand Drill with countersink bit	Practicing proper method of countersinking holes to correct depth in various metals	Observation
			Preparing a piece of metal showing depth as "too shallow" - "too deep" and "correct".	Check workpiece
Selecting appropriate hand drill for the task	Lecture	Various types and sizes of hand drills	Assignment: Reading Unit #34, Modern Metalworking, Walker, pp. 34-1 - 34-24.	Oral quiz
Selecting proper countersink for the task	Lecture	60° Countersink 82° Countersink 90° Countersink 100° Countersink 110° Countersink 120° Countersink	Preparing a sketch of the types of countersink bits showing angles and uses	Check sketch
			Assignment: Reading Unit #2, Modern Metalworking, Walker, pp. 2-1 - 2-6.	

TASK NO. 17 : COUNTERSINK HOLE WITH POWER DRILL TO PRODUCE A FASTENER RECEIVER HOLE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece b. Type of operation c. Finish and accuracy required d. Number of parts to be countersunk e. Kind of material	Lecture: As needed to review information on print	Blueprints	Read prints during instruction	Oral or written quiz
Mounting countersink in hand power drill	Demonstrate a. Inserting b. Tightening	Hand Power Drill Countersink	Mounting countersink in drill as to proper instructions	Observation
Countersinking drilled hole with countersink in power drill to produce a fastener receiver hole.	Demonstrate showing proper speed, proper depth, lubricant	Overhead Projector Transparency No. 6F, Common Drill Operations, 3M Company, Metal Working, Industrial Arts, No. 6, Catalog No. 644.	Making various countersunk holes in a variety of metals to meet specifications	Observation
Selecting appropriate power drill for the task	Lecture	Hand Power Drills Battery Powered Drill	Collecting from suppliers descriptive folders showing features and specifications of various drills	Check results
			Assignment: Reading Unit #34, Modern Metalworking, Walker, pp. 34-1 - 34-24.	Oral or written quiz
Selecting proper countersink for the task	Lecture	Countersink Bits Combination Countersink and Center Bits	Preparing, through research, a list of specifications of various sizes and types of countersink bits	Check results
			Assignment: Reading Unit #2, Modern Metalworking, Walker, pp. 2-1 - 2-6.	Oral or written quiz

TASK NO. 18: TAPPING HOLES WITH TAPS TO PRODUCE A THREADED HOLE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece to be tapped b. Type of operation c. Finish and accuracy required d. Number of parts to be tapped e. Kind of material	Remedial Lecture	Blueprints (Transparency) Overhead Projector	Watching screen as teacher points out details	Oral or written quiz
Applying knowledge of decimals: a. Adding decimals to determine exact dimensions b. Subtracting decimals to determine exact dimensions c. Multiplying decimals to determine exact dimensions d. Dividing decimals to determine exact dimensions	Remedial Lecture on points not already sufficiently covered	Blueprints Blackboard	Listening to lecture and practicing on blueprints	Oral or written quiz
Mounting tap in tap wrench	Demonstration	Taps T-Handle Tap Wrench Hand Tap Wrench Film Strip - Fundamentals of Benchwork, Film No. 4, Reaming, Tapping, and Threading, The Jam Handy Organization	Inserting various sizes of taps in appropriate wrench Assignment: Reading Unit #11, Modern Metalworking, Walker, pp. 11-1 - 11-8.	Observation
Applying cutting oil to the tapping operation	Lecture and Demonstration	Chart - Recommended Cutting Fluids for Various materials, Modern Metalworking Walker, p. 38-19.	Doing research on various types and qualities of cutting fluids	Quiz - Identifying proper cutting fluid with various metals
Tapping a hole with a tap to produce a threaded hole	Lecture and Demonstration a. Starting Tap b. Breaking Chips c. Cleaning Tapped Hole	Taps - Taper Plug Bottoming	Tapping holes of various sizes under supervision of instructor	Observation
Removing tap from finished hole	Demonstration a. Removal b. Cleaning	Taps Tap Wrench Workpiece	Practicing proper technique under instructor's supervision	Observation
Selecting appropriate tapping wrench for the task	Lecture a. Size of tap b. Location	Hand Top Wrench T-Handle Wrench	Making a list of operations where hand tap wrenches are a necessity in accomplishing certain jobs in industry	Check and discuss students' list

TASK NO. 18 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERI LS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting tap for task	Lecture a. Size of Tap b. Number of Threads c. Tap Drill Size	Overhead Projector Chart - Decimal Equivalents and Tap Drill Sizes, L. S. Starrett Co.	Using various prints, selecting proper taps and tap drills according to specifications	Checking and discussing results
			Assignment: Reading Unit #2, Modern Metalworking, Walker, pp. 2-1 - 2-6.	Oral or written quiz
Tapping hole according to type of material	Lecture and Demonstration a. Lubricant b. Pressure c. Removal of broken tap	Set of Taps Lubricant	Using various material, practicing proper tapping technique in each	Observation
			Assignment: Reading Unit #2, Modern Metalworking, Walker, pp. 2-1 - 2-6.	Oral or written quiz

TASK NO. 19: CUTTING THREADS WITH DIES TO PRODUCE A THREADED MEMBER

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece to have threads cut b. Type of operation c. Finish and accuracy required d. Number of parts to have threads cut e. Kind of material	Lecture Overhead Projector	Overhead Projector Transparency of blueprint	Watching screen as teacher points out details	Oral questioning
Applying knowledge of decimals: a. Adding decimals to determine exact dimensions b. Subtracting decimals to determine exact dimensions c. Multiplying decimals to determine exact dimensions d. Dividing decimals to determine exact dimensions	Remedial work (as needed)	Blueprints Blackboard	Listening to lecture and practicing on blueprints.	Oral or written quiz.
Mounting die in die stock	Demonstration a. Inserting b. Securing	Die Stock Dies Film Strip - Fundamentals of Benchwork, Film No. 4, Reaming, Tapping, and Threading, The Jam Handy Organization	Practicing proper method of mounting die in die stock Watching film strips Assignment: Reading Unit #11, Modern Metal-working, Walker, pp. 11-1 - 11-8.	Observation
Applying oil to cutting process according to type of material being threaded	Lecture and Demonstration a. Type b. Amount	Chart - Recommended Cutting fluids for various metals, Modern Metalworking, Walker, p. 38-19	Applying proper oiling techniques when cutting threads in various materials.	Written test - Identifying type of cutting fluid recommended for various metals
Cutting stock with a die to produce external threads	Demonstration a. Chamfer Stock b. Set die to correct size c. Start die on correct side d. Break chips e. Lubricant	Dies a. Round (adjustable and non adjustable) b. Hexagonal c. Square Die Stock Oil	Practicing proper method of cutting threads with dies under supervision of instructor Assignment: Reading Unit #2, Modern Metal-Working, Walker, pp. 2-1 - 2-6.	Observation Oral or written quiz
Removing die from finished external thread	Demonstration a. Removal b. Cleaning	Dies Die Stock Film Strip - Fundamentals of Benchwork, Film No. 4, Reaming, Tapping, and Threading, the Jam Handy Organization	Practicing proper method under supervision of instructor Assignment: Reading Unit #2, Modern Metal-working, Walker, pp. 2-1 - 2-6.	Observation Oral or written quiz

Task No. 19 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting appropriate wrench for holding die for task	Lecture Die Stocks a. Length b. Type 1. Hex Die 2. Round Die 3. Square Die	Various Dies Die Stocks Transparency (Teacher Prepared) Die Shapes and sizes in relation to proper die stocks Film Strip - Fundamentals of Benchwork, Film No. 4, Reaming, Tapping, and Threading, The Jam Handy Organization	Selecting appropriate die wrench to match various shapes and sizes of dies Assignment: Reading Unit #2, Modern Metalworking, Walker, pp. 2-1 - 2-6.	Check accuracy Oral or written quiz
Selecting appropriate die for task	Lecture a. Kind of threads b. Diameter of stock	Various Dies Prints Film Strip - Fundamentals of Benchwork, Film No. 4, Reaming, Tapping, and Threading, The Jam Handy Organization	Using prints choosing the correct die for various operations as called for in specifications Assignment: Reading Unit #2, Modern Metalworking, Walker, pp. 2-1 - 2-6.	Check and discuss results Oral or written quiz
Cutting threads according to type of material	Demonstration a. Hardness b. Lubricant	Film Strip - Fundamentals of Benchwork, Film No. 4, Reaming, Tapping, and Threading, The Jam Handy Organization	Practicing cutting threads on a variety of materials according to directions of instructor Assignment: Reading Unit #2, Modern Metalworking, Walker, pp. 2-1 - 2-6.	Observation

TASK NO. 20: PUNCHING MATERIALS WITH HAND PUNCHES TO PRODUCE A HOLE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece to be punched b. Finish and accuracy required c. Number of parts to be punched d. Kind of material	Lecture (Using overhead) (Remedial Work)	Overhead Projector Transparency of Blueprint (Teacher Made)	Watching screen as teacher points out details	Oral questions
Laying out stock with a: a. Square b. Rule or scale c. Combination square d. Dividers e. Trammel Points f. Scriber g. Center Punch	Film Strips Demonstration (As Needed) a. Use b. Care	Film Strips - Fundamentals of Benchwork, Films No. 8 and 9, Layout Work, Parts 1 2, The Jam Handy Organization	Watching film strips Practice proper use (as needed)	Oral or written quiz
Punching gasket materials with a gasket punch	Demonstration a. Hollow Punch b. Hand Operated Punch c. Backing	Hollow Punches Hand Operated Punches	Practicing proper punching procedure under supervision of instructor	Observation
			Assignment: Reading Unit 12, Metalwork Essentials, Tustison, Kranzusch, Blide, pp. 59-63.	Oral or written quiz
Punch light gauge metals with a hollow metal cutting punch	Demonstration a. Use b. Care c. Backing Plate Use	Punches Sheet Metal Hammer	Practicing proper procedure as outlined during demonstration	Observation
			Assignment: Reading Unit 12, Metalwork Essentials, Tustison, Kranzusch, Blide, pp. 59-63.	Oral or Written Quiz.
Aligning punch with layout lines and points for accurate punching	Demonstration a. Center Punching b. Special stop gauge	Punch	Practicing proper procedure	Observation
Selecting punch required for job	Lecture a. Size of Hole b. Size of Metal	Hollow Punch Solid Punch Bench lever punch	Assignment: Reading Unit 12, Metalwork Essentials, Tustison, Kranzusch, Blide, pp. 59-63.	Written Quiz
Using punches which have had heads ground safely	Lecture Demonstration a. Proper method of grinding head b. Results of proper use	Punches (properly and improperly ground)	Practicing grinding a punch under supervision of instructor	Observation

TASK NO. 21: PUNCHING MATERIALS WITH POWER TOOLS TO PRODUCE A HOLE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece to be punched b. Finish and accuracy required c. Number of parts to be punched d. Kind of material	Lecture (Using Overhead) (Remedial Work)	Overhead Projector Transparency of blueprint (Teacher Made)	Watching screen of overhead as instructor points out details	Oral questioning
Laying out stock with a: a. Square b. Rule or Square c. Combination Square d. Dividers e. Trammel Points f. Scriber g. Center Punch	Film Strips Demonstration (As Needed) a. Use b. Care	Film Strips - Fundamentals of Benchwork, Films No. 8 and 9, Layout Work, Parts 1 and 2, The Jam Handy Organization	Watching film strips Practicing proper use of layout tools not already sufficiently covered	Oral or written quiz Observation
Operating power punch to produce holes	Demonstration a. Use b. Care c. Safety Video Tape (Close-ups)	Power Punch Video Tape	Practicing proper use of power punch under supervision of instructor Additional Credit - Having students make a list of various jobs done on power presses in local industries	Observation Oral Questioning
Aligning layout lines with punch for accurate punch	Demonstrate a. Jigs b. Fixtures	Power Punch	Practicing proper procedure	Observations
Practicing keeping hands away from punching area	Lecture a. Danger Areas b. Protective Equipment	Safety Charts (As available from industry or teacher made)	Listing safety regulations that apply to operating power punching tools	Check results

TASK NO. 22: CHECKING DIMENSIONS OF DETAILS WITH PRECISION INSTRUMENTS FOR ACCURATE ASSEMBLY

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size of the workpiece b. Finish and accuracy required	Lecture Overhead	Overhead Projector Transparency of blueprint	Watching screen as teacher explains	Oral questioning
Checking squareness of objects with a try-square	Demonstration a. Use b. Care	Try-Square Film Strip - Fundamentals of Benchwork Film No. I - Hand Tools, Jam Handy Or Organization	Assignment: Reading Unit 6 - Layout Work, Modern Metalworking, Walker, pp. 6-I -6-10. Practicing correct use	Oral or written quiz Observation
Checking squareness of objects with a carpenter's square	Demonstration a. Use b. Care	Carpenter's Square Film Strip - Fundamentals of Benchwork Film No. I - Hand Tools, Jam Handy Organization	Assignment:- Reading Unit 6 - Layout Work, Modern Metalworking, Walker, pp. 6-I - 6-10. Watching film strip Practicing correct use	Oral or written quiz Observation
Checking dimensions of details with divider to verify layout	Demonstration a. Use b. Care	Divider Pamphlet - The Tools and Rules for Precision Measuring, L. S. Starrett Co. 16mm Film - The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Assignment: Reading Unit 6 - Layout Work, Modern Metalworking, Walker, pp. 6-I - 6-10 Watching film Practicing correct use	Oral or written quiz Observation
Checking angles of objects with a combination square	Demonstration a. Use b. Care	Combination Square 16mm Film - The Tools and Rules for Precision Measuring, L. S. Starrett Co. Pamphlet - The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Practicing Proper Use Assignment: Reading Unit 6 - Layout Work, Modern Metalworking, Walker, pp. 6-I - 6-10.	Oral or written quiz
Checking angles of objects with a sliding T-bevel	Demonstration a. Use b. Care	Sliding T-bevel 16mm Film - The Tools and Rules for Precision Measuring, L. S. Starrett Co. Pamphlet - The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Practicing proper use Assignment: Reading Unit #4, Modern Metal-working, Walker, pp. 4-I - 4-26.	Oral or written quiz
Checking gauge of wire with wire gauge	Demonstration a. Use b. Care	Wire Gages a. United States Standard b.. American Standard	Assignment: Reading Part of Unit #39, Metal Work Technology and Practice, Ludwig, pp. 288-289. Practicing Proper use	Oral or written quiz
Checking gauge of sheet metal with wire gauge	Demonstration a. Use b. Care	Sheet Metal Gages a. United States Standard b. American Standard	Assignment: Reading Unit #6 - Layout Work, Modern Metalworking, Walker, pp. 6-I - 6-10. Practicing proper use	Oral or written quiz

Task No. 22 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Determining number of threads per inch with a thread gauge	Demonstration a. Use b. Care	Thread Gauge 16mm Film - The Tools and Rules for Precision Measuring, L. S. Starrett Co. Pamphlet - The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Practicing proper use Assignment: Reading Unit #36, Metal Work Technology and Practice, Ludwig, pp. 265-67.	Observation Oral or written quiz
Checking dimension of subassemblies for accuracy with a micrometer (inside and outside)	Demonstration a. Use b. Care	Micrometer (Inside and Outside) Chart - How To Read a Micrometer, L. S. Starrett Co. Pamphlet - How To Read Use Care for Micrometers, L. S. Starrett Co. Pamphlet - The Tools and Rules for Precision Measuring, L. S. Starrett Co. 16mm Film - The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Practicing proper use Assignment: Reading Unit #36, Metal Work Technology and Practice, Ludwig, pp. 265-67	Observation Oral or written quiz
Checking dimensions for accuracy with outside calipers	Demonstration a. Use b. Care	Pamphlet - The Tools and Rules for Precision Measuring, L. S. Starrett Co. 16mm Film - The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Practicing proper use Assignment: Reading Unit #36, Metal Work Technology and Practice, Ludwig, pp. 265-67	Observation Oral or written quiz
Checking dimensions for accuracy with form gauge block	Demonstration a. Use b. Care	Pamphlet - The Tools and Rules for Precision Measuring, L. S. Starrett Co. 16mm Film - The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Practicing proper use Assignment: Reading Unit #36, Metal Work Technology and Practice, Ludwig, pp. 265-67	Observation Oral or written quiz
Checking dimensions for accuracy with inside calipers	Demonstration a. Use b. Care	Inside Calipers Pamphlet - The Tools and Rules for Precision Measuring, L. S. Starrett Co. 16 mm Film - The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Practicing proper use Assignment: Reading Unit #36, Metal Work Technology and Practice, Ludwig, pp. 265-67	Observation Oral or written quiz
Calculating unknown dimensions from known dimensions to check for accuracy	Remedial math work	Assignment Sheet	Solving problems on sheet.	Check assignment.
Applying knowledge of fractional parts of an inch: a. Multiplying fractions to determine exact dimensions b. Adding fractions to determine exact dimensions c. Subtracting fractions to determine exact dimensions d. Dividing fractions to determine exact dimensions	Remedial work on subjects not already sufficiently covered	Blueprints	Practice solving problems involving fractions.	Written test.

ask No. 22 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Applying knowledge of decimals: a. Adding decimals to determine exact dimensions b. Subtracting decimals to determine exact dimensions c. Multiplying decimals to determine exact dimensions d. Dividing decimals to determine exact dimensions	Remedial work on items not already sufficiently covered	Assignment sheet on decimals.	Solve assigned problems	Check assignment
Selecting appropriate precision instrument for dimensions to be checked	Lecture	Film Strip - Fundamentals of Benchwork, Film No. 8, Layout Tools and Measuring Instruments, Jam Handy Organization Pamphlet - The Tools and Rules for Precision Measiring, L. S. Starrett Co. 16mm Film - The Tools and Rules for Precision Measiring, L. S. Starrett Co.	Watching film and film strips	Written test - Matching proper measuring instrument with job to be done
Practicing safe instrument handling for accurate measurement	Lecture	Film Strip - Fundamentals of Benchwork, Film No. 8, Layout Tools and Measuring Instruments, Jam Handy Organization Pamphlet - The Tools and Rules for Precision Measiring, L. S. Starrett Co. 16mm Film - The Tools and Rules for Precision Measiring, L. S. Starrett Co.	Watch film and film strips	Written or oral quiz

TASK NO. 23: CHECKING DIMENSIONS OF SUB-ASSEMBLIES AND ASSEMBLIES TO PRODUCE ACCURATE ASSEMBLIES

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size of the workpiece b. Finish and accuracy required	Lecture Overhead	Overhead Projector Transparency of blueprint	Watching screen as teacher explains.	Oral Questioning.
Checking squareness of objects with a try-square	Demonstration a. Use b. Care	Try-Square Film Strip - Fundamentals of Benchwork, Film No. 1, Hand Tools, Jam Handy Organization	Assignment: Reading Unit #6, Layout Work, Modern Metalworking, Walker, pp. 6-1 - 6-10. Watching Film Strip. Practicing correct use.	Oral or written quiz Observation
Checking squareness of objects with a carpenter's square	Demonstration a. Use b. Care	Carpenter's Square Film Strip - Fundamentals of Benchwork, Film No. 1, Hand Tools, Jam Handy Organization	Assignment: Reading unit 2, Modern Metalworking, Walker, pp. 2-1 - 2-6. Practicing correct use	Oral or written quiz. Observation
Checking dimensions of details with divider to verify layout	Demonstration a. Use b. Care	Divider Pamphlet - The Tools and Rules for Precision Measuring, L. S. Starrett Co. 16 mm Film - The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Assignment: Reading Unit 2, Modern Metalworking, Walker, pp. 2-1 - 2-6. Practicing correct use Watching film.	Oral or written quiz. Observation
Checking angles of objects with a combination square	Demonstration a. Use b. Care	Combination Square Film: "Tools and Rules for Precision Measuring," 16 mm., L. S. Starrett Co. Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett, Co.	Practicing proper use Assignment: Reading Unit #4, Modern Metalworking, Walker, pp. 4-1 - 4-26.	Oral or written quiz
Checking angles of objects with a sliding T-bevel	Demonstration a. Use b. Care	Sliding T-Bevel Film: "Tools and Rules for Precision Measuring," 16 mm., L. S. Starrett Co. Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Watching screen as teacher elaborates Assignment: Reading Unit #2, Modern Metalworking, Walker, pp. 2-1 - 2-6.	Oral Questioning Written Quiz
Checking gauge of wire with wire gauge	Demonstration a. Use b. Care	Wire Gages a. United States Standard b. American Standard	Assignment: Reading part of Unit #39, Metal Work Technology and Practice, Ludwig, pp. 288-289. Practicing proper use	Oral or written quiz
Checking gauge of sheet metal with wire gauge	Demonstration a. Use b. Care	Sheet Metal Gages a. United States Standard b. American Standard	Assignment: Reading Unit #6, Layout Work, Modern Metalworking, Walker, pp. 6-1 - 6-10. Practicing proper use	Oral or written quiz

Task No. 23 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Determining number of threads per inch with a thread gauge	Demonstration a. Use b. Care	Thread Gage Film: "Tools and Rules for Precision Measuring," 16 mm., L. S. Starrett Co. Pamphlet: Tools and Rules for Precision Measuring, L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metalworking, Walker, pp. 4-1 - 4-26.	Observation Oral or written quiz
Checking dimension of sub-assemblies for accuracy with a micrometer (inside and outside)	Demonstration a. Use b. Care	Micrometer (Inside and Outside) Chart: How To Read A Micrometer, L. S. Starrett, Co. Pamphlet: How To Read Use Care for Micrometers. Pamphlet: Tools and Rules for Precision Measuring, L. S. Starrett Co. Film: "Tools and Rules for Precision Measuring,"L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metalworking, Walker, pp. 4-1 - 4-26.	Observation Oral or written quiz
Checking dimensions for accuracy with outside calipers	Demonstration a. Use b. Care	Outside Calipers Film: "Tools and Rules for Precision Measuring," 16 mm., L. S. Starrett Co. Pamphlet: Tools and Rules for Precision Measuring, L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metalworking, Walker, pp. 4-1 - 4-26.	Observation
Checking dimensions for accuracy with form gauge block	Demonstration a. Use b. Care	Form Gauge Block Pamphlet: Tools and Rules for Precision Measuring, L. S. Starrett Co. Film: "Tools and Rules for Precision Measuring," L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metalworking, Walker, pp. 4-1 - 4-26.	Observation Oral or written quiz
Checking dimensions for accuracy with inside calipers	Demonstration a. Use b. Care	Inside Calipers Pamphlet: Tools and Rules for Precision Measuring, L. S. Starrett Co. Film: "Tools and Rules for Precision Measuring," L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metalworking, Walker, pp. 4-1 - 4-26.	Observation Oral or written quiz
Calculating unknown dimensions from known dimensions to check for accuracy	Remedial math work	Assignment sheet	Solving problems on sheet	Check Assignment
Applying knowledge of fractional parts of an inch: a. Multiplying fractions to determine exact dimensions b. Adding fractions to determine exact dimensions c. Subtracting fractions to determine exact dimensions d. Dividing fractions to determine exact dimensions	Remedial work on subjects not already sufficiently covered.	Blueprints	Practice solving problems involving fractions.	Written test.

Task No. 23 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Applying knowledge of decimals: a. Adding decimals to determine exact dimensions b. Subtracting decimals to determine exact dimensions c. Multiplying decimals to determine exact dimensions d. Dividing decimals to determine exact dimensions	Remedial work on items not already sufficiently covered.	Assignment Sheet on decimals	Solve Assigned Problems	Check Assignment
Selecting appropriate precision instrument for dimensions to be checked	Lecture	Film Strip: Fundamentals of Benchwork, Film No. 8, Layout Tools and Measuring Instruments, Jam Handy Organization. Pamphlet: Tools and Rules for Precision Measuring, L. S. Starrett Co. Film: "Tools and Rules for Precision Measuring," L. S. Starrett Co.	Watching film and film strips.	Written Test - Matching proper measuring instrument with job to be done.
Practicing safe instrument handling for accuracy measurement.	Lecture	Film Strip: Fundamentals of Benchwork, Film No. 8, Layout Tools and Measuring Instruments, Jam Handy Organization. Pamphlet: Tools and Rules for Precision Measuring, L. S. Starrett Co. Film: "Tools and Rules for Precision Measuring," L. S. Starrett Co.	Watch film and film strips	Written or oral quiz

TASK NO. 24: MEASURING STOCK WITH PRECISION INSTRUMENTS FOR ASSEMBLY

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprints to determine dimensions of sub-assemblies and assemblies	Lecture (Using Overhead)	Overhead Projector Transparency of blueprint (Teacher Made)	Watching screen while teacher explains	Oral quiz
Measuring objects with a tape rule to determine length	Demonstration a. Use b. Care Overhead Projector	Tape Rule Overhead Projector Transparencies (using overlays) Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metal-working, Walker, pp. 4-1 - 4-26. Practicing proper use	Oral or written quiz Observation
Measuring objects with a steel rule to determine length	Demonstration a. Use b. Care Overhead Projector	Steel Rule Overhead Projector Transparencies (using overlays) Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metal-working, Walker, pp. 4-1 - 4-26. Practicing proper use	Oral or written quiz Observation
Measuring objects with a steel tape to determine length	Demonstration a. Use b. Care Overhead Projector	Steel Tape Overhead Projector Transparencies (using overlays) Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metal-working, Walker, pp. 4-1 - 4-26. Practicing proper use	Oral or written quiz Observation
Measuring objects with a folding tape to determine length	Demonstration a. Use b. Care Overhead Projector	Folding Rule Transparencies (using overlays) Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metal-working, Walker, pp. 4-1 - 4-26. Practicing proper use	Oral or written quiz Observation
Measuring objects with a hook rule to determine length	Demonstration a. Use b. Care Overhead Projector	Hook Rule Transparencies (using overlays) Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metal-working, Walker, pp. 4-1 - 4-26. Practicing proper use	Oral or written quiz Observation
Measuring outside and inside dimension of an object with vernier caliper to determine dimensions	Demonstration a. Use b. Care Overhead Projector	Vernier Calipers Transparencies (using overlays) Pamphlet: The Tools and Rules for Precision Precision Measuring, L. S. Starrett Co. Pamphlet: How to Read Use Care for M Micrometers and Vernier Gages, L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metal-working, Walker, pp. 4-1 - 4-26. Practicing proper use	Oral or written quiz Observation

Task No. 24 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Measuring outside dimension of an object with an outside micrometer to determine dimension	Demonstration a. Use b. Care	Outside Micrometer Transparencies (using overlays) Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett Co. Chart - How to Read a Micrometer, L. S. Starrett Co. Pamphlet: How To Read Use Care for Micrometers and Vernier Gages, L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metal-working, Walker, pp. 4-1 - 4-26. Practicing proper use Using cardboard tubes, making a large working model of a micrometer's hub and thimble as a special assignment	Oral or written quiz Observation
Measuring outside dimensions with outside calipers to determine dimension	Demonstration a. Use b. Care Overhead Projector	Outside Calipers Transparencies (using overlays) Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Assignment: Reading Unit #5, Modern Metal-working, Walker, pp. 5-1 - 5-2. Practicing proper use	Oral or written quiz Observation
Measuring inside dimension of an object with an inside micrometer to determine dimension	Demonstration a. Use b. Care Overhead Projector	Overhead Projector Transparencies Pamphlet: How to Read Use Care for Micrometers and Vernier Gages, L. S. Starrett Co. Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metal-working, Walker, pp. 4-1 - 4-26. Practicing proper use	Oral or written quiz Observation
Measuring inside dimension of an object with inside calipers to determine dimension	Demonstration a. Use b. Care Overhead Projector	Overhead Projector Transparencies Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metal-working, Walker, pp. 4-1 - 4-26. Practicing proper use	Oral or written quiz Observation
Measuring depth dimensions with a depth micrometer	Demonstration a. Use b. Care Overhead Projector	Overhead Projector Transparencies Pamphlet: How to Read Use Care for Micrometers and Vernier Gages, L. S. Starrett Co. Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metal-working, Walker, pp. 4-1 - 4-26. Practicing proper use	Oral or written quiz Observation
Measuring screw threads with a screw thread micrometer	Demonstration a. Use b. Care Overhead Projector	Overhead Projector Transparencies Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metal-working, Walker, pp. 4-1.- 4-26. Practicing proper use	Oral or written quiz Observation

Task No. 24 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Measuring small openings with feelers gage to determine dimension	Demonstration a. Use b. Care Overhead Projector	Overhead Projector Transparencies Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett Co.	Assignment: Reading Unit #4, Modern Metalworking, Walker, pp. 4-1 - 4-26. Practicing proper use	Oral or written quiz Observation
Applying knowledge of fractional parts of an inch a. Multiplying fractions to determine exact dimensions b. Adding fractions to determine exact dimensions c. Subtracting fractions to determine exact dimensions d. Dividing fractions to determine exact dimensions	Remedial Work on items not already sufficiently covered	Assignment sheet on fractions	Solving assigned problems.	Check Assignment.
Applying knowledge of decimals a. Adding decimals to determine exact dimensions b. Subtracting decimals to determine exact dimensions c. Multiplying decimals to determine exact dimensions d. Dividing decimals to determine exact dimensions	Remedial work on items not already sufficiently covered	Assignment sheet on decimals	Solving Assigned Problems.	Check Assignment.
Selecting appropriate measuring devices for task	Lecture	Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett Co. Pamphlet: How to Read Use Care for Micrometers and Vernier Gages, L. S. Starrett Co.	Extra Credit Assignment - Visiting some local industry and obtaining information on any specialized use of precision measuring instruments	Oral or written quiz
Practicing safe instrument handling for accurate measurement	Lecture Demonstration a. Use b. Care	Pamphlet: The Tools and Rules for Precision Measuring, L. S. Starrett Co. Pamphlet: How to Read Use Care for Micrometers and Vernier Gages, L. S. Starrett Co.	Practicing proper use	Oral or written quiz Observation

TASK NO. 25: STAMPING NUMBER AND LETTERS ON METAL STOCK FOR IDENTIFICATION

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprints to determine style and size number and/or others to be stamped on items	Lecture - Using over-head projector	Overhead Projector Transparency of Blueprint (Teacher Made)	Watching screen as instructor points out information	Oral questioning
Applying knowledge of fractional parts of an inch: a. Multiplying fractions to determine exact dimensions b. Adding fractions to determine exact dimensions c. Subtracting fractions to determine exact dimensions d. Dividing fractions to determine exact dimensions	Remedial work as needed	Assignment Sheet	Solving Assigned Problems.	Check Assignment.
Laying out stock with a: a. Square b. Rule or scale c. Combination Square d. Dividers e. Trammel Points f. Scriber	Lecture Film Strip Demonstrate (if not already sufficiently covered)	Film Strip Projector Film Strip - Fundamentals of Benchwork, Films No. 9 and 10. Layout Work Parts I and 2, Jam Handy Organization	Watching film strip Practicing proper use of any layout tools not already sufficiently covered	Oral or written quiz
Aligning numbers and/or letters with layout line	Demonstration Video Tape	Number and letter stamps	Practicing proper alignment under supervision of instructor Watching video tape monitor	Observation
Stamping numbers and/or letters on metal	Demonstration a. Size and kind of hammer used in relation to metal b. Technique c. Practicing on wood	Stamps Hammers Various kinds of metal	Practicing proper stamping procedure under instructor's supervision	Observation
Selecting number and/or letters to be used	Lecture	Number Stamps (Various sizes) Letter Stamps (Various sizes) Electric Engraver	Assignment: Reading Unit #34, Metal Work Technology and Practice, Ludwig, Nos. 1123-1126-1127, pp. 417- 418.	Oral or written quiz

TASK NO. 28: HAMMERING APPROPRIATE METAL PARTS WITH VARIOUS HAMMERS

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Hammering appropriate material with: a. Ball peen hammer b. Straight peen hammer c. Cross peen hammer d. Soft faced hammer e. Wooden hammer f. Tack hammer	Lecture a. Use of each type of hammer b. Proper and improper use File Strip	Hammers of each type File Strip Projector File Strip - Fundamentals of Benchwork, File No. 1, Hand Tools, The Jam Handy Organization	Watching file strip	Written quiz on uses of various types of hammers
Selecting appropriate hammer for job to be accomplished	Lecture a. Hammer types for various jobs b. Hammer Sizes	Overhead Projector Transparencies (Teacher Made)	Watching screen of overhead projector	Matching type quiz - matching hammer type to type of job
Recognizing the necessity of using a hammer with the head tight to the handle	Lecture a. Types of handle materials b. Wedges c. Soaking handle in oil Demonstrate proper method of installing hammer head on handle	Hammers (Handles properly and improperly secured) File - ABC's of Hand Tools, General Motors File Library Stanley Safety Charts	Assignment: Reading Unit #3, Metal Work Technology and Practice, Ludwig, No. 81, p. 48.	Written quiz

TASK NO. 27: FLARING METAL TUBING WITH FLARING TOOL TO PRODUCE A FLARE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Mounting tubing in tube-flaring tool	Demonstration	Tube-Flaring Tool Birmingham Gage Tubing - Variety of sizes, wall thicknesses, and types of metals	Watching Demonstration Practicing mounting tubing in flaring tool	Observation
Flaring metal tubing with tube-flaring tool	Demonstration Discuss purpose of flaring	Tube-Flaring Tool Tubing	Watching Demonstration Making a list of common uses of a flaring tool in making joints	
			Practicing proper use of flaring tool	Observation
Checking to see if burrs have been removed.	Lecture Show pieces of tubing before and after deburring	Tubing File Emery Cloth	Having students choose the properly deburred tubing from a group containing both good and bad	Observation
Checking to see if tubing has been cut squarely	Demonstration using try-square	Tubing Try-Square	Various class members demonstrating method of checking squareness	Observation
Selecting appropriate flaring tool for the task.	Lecture Point out manner in which to choose which flaring tool is designed to match size of tubing.	Flaring Tools Various Sizes of Tubing	Assignment: Reading Unit #38, Nos. 779, 780, 781, 782, Metal Work Technology and Practice, Ludwig, p. 282.	Written quiz

TASK NO. 28: ALIGNING PARTS IN SUB-ASSEMBLIES AND ASSEMBLIES WITH HAND TOOLS

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading working drawing to determine parts relationship	Lecture Point out details with help of overhead projector	Overhead Projector Transparencies	Watching screen while teacher elaborates	Oral questioning
Aligning parts with an alignment punch	Demonstration Video Camera (live on monitor)	Alignment Punch Hammer	Watching demonstration on monitor Practicing proper use of alignment punch	Observe students in their use of punch
Selecting correct tool for aligning	Lecture Demonstration	Various sizes of aligning punches Various parts to assemble	Reading Assignment: Unit #35, Item No. 701, Metal Work Technology and Practice, Ludwig; pp. 261-262.	Oral or written quiz

OCCUPATIONAL INFORMATION UNIT FOR ASSEMBLY

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
The employment outlook: 1. Local 2. National	Lecture. Guest speaker from local employment office.	Charts (employment forecast). Publication: Employment Outlook for Factory Operatives, 1966-67 edition, Occupational Outlook Handbook, Department of Labor, Government Printing Office, Washington, D.C., pp. 2-3.	Listening to lecture. Listening to guest speaker. Asking oral questions.	Oral questioning.
The wage scale: 1. Local a. union (1) apprentice (2) journeyman (3) master b. non-union (1) entry wages (2) experienced 2. National a. union (1) apprentice (2) journeyman (3) master b. non-union (1) entry wages (2) experienced	Lecture. Overhead projector. Guest speaker - union, non-union representative.	Transparencies (teacher-made charts of wages). Publication: Employment Outlook for Factory Operatives, 1966-67 edition, Occupational Outlook Handbook, Department of Labor, Government Printing Office, Washington, D.C., pp. 2-3.	Listening to lecture. Watching screen as teacher explains transparency. Reading section of pamphlet pertaining to wages of assemblies. Assignment: Writing to various parts of the nation to union, companies, etc. to obtain wage information.	Oral or written quiz. Oral report on answers to letters.
The types of training available.	Lecture. Field trip - local industry employing large numbers of assembly workers,	Teacher-made chart listing types of training for assembly workers.	Listening to lecture. Attending field trip. Assignment: Contacting various types of local industries to obtain information as to type of training, length of training, etc. and making a written or oral report.	Check results of report.
The working conditions experienced in the occupation.	Lecture. 35mm slide presentation.	Teacher-prepared 35mm slide presentation showing working conditions in various assembly occupations.	Watching slide presentation. Listening to lecture. Assignment: Making a chart listing types of assembly and showing how conditions differ.	Check results of assignment.
The physical and mental characteristics needed for qualification for employment.	Lecture. Presentation by local employer.	Publication: Employment Outlook for Factory Operatives, 1966-67 edition, Occupational Outlook Handbook, Department of Labor, Government Printing Office, Washington, D.C., pp. 1-2.	Listening to lecture. Assignment: Reading section of pamphlet related to job qualifications.	Oral or written questions.

OCCUPATIONAL INFORMATION UNIT FOR ASSEMBLY (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
The geographical location of employment.	Lecture.	Map of U.S.A. Guide to Chamber of Commerce Offices in the U.S.	Listening to lecture. Assignment: Writing to various Chamber of Commerce Offices of large cities to obtain employment figures. Place information on maps.	Check results of assignment.
The opportunities for advancement.	Lecture. Guest speaker - local person who has advanced to supervisor of assembly.	Industry publications concerning their employees wages, order of advancement, etc.	Listening to speaker and asking relevant questions.	Oral questioning.
The advantages and disadvantages of the occupation.	Lecture. Panel discussion.	Industrial pamphlets available pertaining to subject.	Obtaining information and participating in panel discussion.	Observe discussion.
The nature of the work involved in the occupation.	Lecture.	Publication: Employment Outlook for Factory Operatives, 1966-67 edition, Occupational Outlook Handbook, Department of Labor, Government Printing Office, Washington, D.C., p. 1.	Reading assignment in pamphlet pertaining to nature of the work.	Oral or written quiz.
The union involvement in the occupation.	Guest speaker - local union representative.	Tape recording of talk by union representative. Tape recorder.	Using information already assembled in other areas of the task, make a survey to determine the percentages of union and non-union assemblers.	Check assignment.

MACHINING

TASK NO. 1: GRINDING THE TWO MOST USED LATHE TOOL BITS (FOR OFF-HAND GRINDING)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading chart to determine: a. Lathe tool data for machining various metals. b. Type of tool bit to be ground.	Lecture Demonstration	Material: Chart - "Lathe Tools," Metalwork Technology and Practice - McKnight and McKnight	Reading chart to determine: a. Lathe tool data for machining various metals. b. Type of tool bit to be ground	Checking with written or oral quiz.
Checking tool, side clearance and front clearance angles with a cutter bit grinding gauge	Demonstration Lecture Teacher prepared video tape recording	Tools: Tool holder Cutter Gauge Proper Ground Tool Bits Material: How To Grind Lathe Tool Cutter Bits, Bulletin #35, South Bend Lathe Works p. 7. How To Run a Lathe, South Bend Lathe Works, p. 28.	Checking tool, side clearance and front clearance angles with a cutter bit grinding gauge.	Checking with written or oral quiz.
Applying knowledge of angles as related to tool bit surfaces	Lecture Demonstration	Tools: Chalk Chalkboard Eraser Materials: Machine Shop Operations and Setups, Porter, Lauche and Lascoe, pp. 136-138. Chart - "Lathe Tools," from Metalwork Technology and Practice - McKnight and McKnight	Applying knowledge of angles as related to tool bit surfaces.	Checking with written or oral quiz.
Selecting proper cutter bit material Selecting a grinding wheel appropriate for task. Practicing proper safety precautions when operating a bench or floor grinder.	Demonstration Lecture	Tools: High speed steel cutter bit blank Grinder and grinding wheels Materials: Engine Lathe Operations, Whipple and Bouden, pp. 34-37. Lathe Work, Machine Shop Series - Delmar Publishers, Inc., pp. 153-156.	Selecting proper cutter bit material and grinding wheel. Practicing proper safety precautions when operating a bench or floor grinder.	Checking with written or oral quiz.
Grinding right hand general turning tool Grinding right hand side or facing tool	Demonstration Teacher prepared video tape recording Film	Tools: High speed steel cutter bit blanks Grinder Safety Goggles Oilstone Materials: Chart - "Lathe Tools," from Metalwork Technology and Practice - McKnight and McKnight. Lathe Work, Machine Shop Series - Delmar Publishers, Inc., pp. 157-164 Film: "Grinding Cutter Bits", 20 min., sound, black and white. South Bend	Grinding right hand general turning and right hand side or facing tool bits. Assignment: Reading Units 1-T50, 1-P50 and 1-P51. Lathe Work, Delmar Publishers, Inc., pp. 153-164. Reading Unit 23, Engine Lathe Operations, Whipple and Bouden, pp. 34-37. Answer the following questions 1, 3, 4, 5, 6, 7, 8 and 9 on page 37.	Observing students grinding right hand general turning and right hand side or facing tool bits. Checking students with a written test.

TASK NO. 2: TURNING STOCK ON LATHE TO PRODUCE A FACED SURFACE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the: a. Kind of material b. Size of work c. Characteristics of work d. Number of parts to be machined. e. Kind of material	Demonstration video tape recording Film	Tools: Scale Materials: Blueprints Blueprint Reading for Beginners in Machine Shop Practice, Delmar Publishers, Inc., pp. 1-4. Film: "The Metal Worker," 29 min., free, black and white, Modern Talking Picture Service.	Class: Reading blueprints while teacher explains. Viewing a film. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on items in film.
Explaining the physical properties of the machinability of various metals. Explaining gear and pulley drive ratios. Explaining heat transfer as it relates to coolants.	Lecture	Tools: Lathe Materials: Engine Lathe Operations, Whipple and Beudek, Unit 28, pp. 44-48. Lathe Work, Delmar Publishers, Inc. pp. 60-64. Engine Lathe Operations, Whipple and Beudek, Unit 27, pp. 43-45.	Class: Listening to teacher's explanation on machinability of various metals, gear and pulley drive ratios and heat transfer as it relates to coolants. Assignment: Reading Unit #82, General-Industrial Machine Shop, Johnson, pp. 337-339. Reading chapter II, Machine Tool Operation, Part I, Burghardt, pp. 36-49.	Checking students on assignments.
Measure stock with a rule or scale to determine length	Demonstration	Tools: Rule or Scale Materials: Stock to be measured	Class: Measuring stock with a rule or scale to to determine length. Assignment: Reading Unit 6, General-Industrial Machine Shop, Johnson, pp. 70-73.	Observing students in measuring stock with a scale or rule to determine length. Checking students on assignment given.
Computing fractional equivalents of decimals. Computing automatic feed for various metals. Computing cutting speeds for various metals. Applying knowledge of fractional parts of an inch. Applying knowledge of decimals.	Lecture	Tools: Chalk Chalkboard Materials: Shop Arithmetic, Delmar Publishers, Inc., Albany 1, New York	Class: Computing fractional equivalents of decimals, automatic feed and cutting speeds for various metals. Applying knowledge of fractional parts of an inch and applying knowledge of decimals. Assignment: Shop Arithmetic, Delmar Publishers, Inc., Unit II, pp. 24-25.	Checking students with a written test.

Task No. 2 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting proper layout tools. Selecting appropriate hacksaw blades. Selecting method of holding stock to be machined. Protecting V-ways with wood when mounting chucks. Selecting proper facing tool for the job. Selecting methods of holding cutting tool.	Films Demonstration	Tools: Lathe with necessary equipment Materials: Scale Hacksaw Wood Facing Tool Tool Holder Brush Rag Safety Goggles Cutting Oil File Abrasive Cloth	Class: Selecting proper layout tools, hacksaw blades, method of holding stock, protecting v-ways, facing tool, methods of holding cutting tools, cutting speeds, direction of cut. Removing and disposing of chips, safety precaution, cutting fluids, file and abrasive cloth. Assignment: Selecting proper tools and equipment to perform task.	Observing students selecting proper tools and equipment to perform task.
Selecting from chart correct cutting speeds for various metals. Selecting direction of cut. Removing and disposing of chips to keep work area clear and free from danger. Practicing proper safety precautions when operating a lathe. Selecting proper cutting fluids for various metals. Selecting proper type of file. Selecting abrasive cloth for removing burrs.	Film and Demonstration	Film: "Plain Turning," 20 min., free, Black and white, South Bend Lathe Tools: Lathe Materials: Engine Lathe Operations, Whipple and [illegible], Units 5, 6, 7, 8, 9, pp. 16-21.	Class: Turning stock on lathe to produce a faced surface. Removing and disposing of chips, safety precaution, cutting fluids, file and abrasive cloth. Assignment: Selecting proper tools and equipment to perform task.	Observing students performance. Checking students with a written test.

Task No. 2 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Mounting: a. Chuck b. Collet c. Face Plate, In-on lathe Cleaning machine to obtain accurate setup Mounting stock on the lathe with: a. Chuck, 3 jaw, 4 jaw b. Collet c. Face Plate Mounting facing tool in holder and tool post and adjust point. Adjusting control to obtain proper spindle speed. Adjusting controls to obtain proper feed. Applying cutting fluids to lubricate cutting action and reduce cutting temperature. Setting depth of cut for roughing cut. Operating lathe to produce a faced surface. Setting depth of cut for finished cut. Removing work from holding devices. Removing burrs from finished work with: a. File b. Abrasive Cloth	Demonstration	Tools: Lathe Materials: Lathe Work, Delmar Publishers, Inc., pp. 106-107.	Class: Setting up and turning stock on lathe to produce a faced surface. Assignment: Reading Unit 43, Engine Lathe Operations, Whipple and Baudek, pp. 72-73. Answer questions on page 73.	Observing students performance. Checking students with a written test.

TASK NO. 3: COUNTERSINKING (COUNTERSINK AND CENTER DRILL) STOCK TO PRODUCE A TAPERED HOLE FOR MOUNTING STOCK BETWEEN CENTERS

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains.	Observing students in selecting material and laying out stock.
Computing cutting speeds for various metals. Applying knowledge of fractional parts of an inch. Applying knowledge of decimals.	Lecture	Tools: Chalk Chalkboard Materials: Shop Arithmetic, Delmar Publishers, Inc., Albany 1, New York	Class: Computing fractional equivalents of decimals, automatic feed and cutting speeds for various metals. Applying knowledge of fractional parts of an inch and applying knowledge of decimals. Assignment: Shop Arithmetic, Delmar Publishers, Inc., Unit 11, pp. 24-25.	Checking students with a written test.
Selecting proper countersink and center drill	Demonstration Lecture	Tools: Combination Drill Jacobs Chuck and Key Materials: Cold Roll Steel	Selecting proper countersink and center drill.	Checking students with written or oral quiz.
Mounting countersink and center drill chuck in tailstock. Operating lathe to produce tapered hole. Removing burrs from finished work with: a. File b. Abrasive Cloth	Demonstration Teacher prepared video tape recording	Tools: Lathe setup for countersinking Materials: Engine Lathe Operations, Whipple and Baudek, pp. 26-28. Cold Roll Steel	Operating lathe to produce tapered hole. Assignment: Reading Units 17 and 18, Engine Lathe Operations, Whipple and Baudek, pp. 27-28. Answer questions at end of units.	Observing students operating lathe to produce tapered hole. Checking students' progress with written test.

TASK NO. 4: TURNING STOCK ON LATHE TO PRODUCE A CYLINDRICAL SHAPE TO .001 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains.	Checking with written or oral quiz.
Measuring stock with an outside caliper, vernier caliper, rule, and micrometer.	Demonstration Film	Tools: Outside Calipers Scale Stock Micrometer Film: "Tools and Rules for Precision Measuring," 30 min., Starret	Measuring stock with an outside caliper, vernier caliper, scale and micrometer.	Checking with written or oral quiz. Observation.
Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of fractional parts of an inch. Applying knowledge of decimals.	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal Equivalent Chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Checking with written or oral quiz. Calculating teacher prepared problems.
Selecting proper lubricant for dead center on lathe. Aligning lathe centers accurately. Mounting turning tool in holder in tool post and adjusting point. Setting depth of cut for roughing. Setting depth of cut for finishing.	Demonstration	Tools: Lathe Dead Center Mandrel Live Center Tool Bit Dial Indicator Materials: Lubricant Engine Lathe Operations, Whipple and Baudek, p. 74.	Selecting proper lubricant for dead center on lathe. Aligning lathe centers accurately. Mounting turning tool in holder, in tool post and adjusting point. Setting depth of cut for roughing. Setting depth of cut for finishing.	Checking with written or oral quiz. Observation
Operating the lathe to produce a cylindrical shape to .001 of an inch.	Demonstration Teacher prepared video tape recording	Tools: Lathe Turning Tool Materials: Cold Rolled Steel Engine Lathe Operations, Whipple and Baudek, p. 74.	Setting up and operating lathe to turn stock to produce a cylindrical shape to .001 of an inch. Assignment: Reading Units 30 and 45, Engine Lathe Operations, Whipple and Baudek, pp. 49 and 74-75. Answer questions at end of units.	Observing students setting up and operating lathe to turn stock to produce a cylindrical shape to .001 of an inch. Checking students' progress with paper and pencil quiz.

TASK NO. 5: TURNING STOCK ON LATHE TO PRODUCE A SHOULDER TO .001 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading Unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting and laying out stock. Paper and pencil test on reading assignment.
Measuring stock with scale or rule to determine length. Measuring with depth micrometers.	Demonstration	Tools: Rule or Scale Materials: Stock to be measured. Depth Micrometer	Class: Measuring stock with a rule or scale to determine length. Assignment: Reading Unit #6, General-Industrial Machine Shop, Johnson, pp. 70-73.	Observing students in measuring stock with a scale or rule to determine length. Checking students on assignment given.
Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of fractional parts of an inch. Applying knowledge of decimals.	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal Equivalent Chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Class: Computing fractional equivalents of decimals, automatic feed and cutting speeds for various metals. Applying knowledge of fractional parts of an inch and applying knowledge of decimals. Assignment: Shop Arithmetic, Delmar Publishers, Inc., Unit 11, pp. 24-25.	Checking students with a written test.
Selecting proper turning tool	Demonstration	Tools: Lathe Dead Center Mandrel Live Center Tool Bit Dial Indicator Materials: Lubricant Engine Lathe Operations, Whipple and Baudek, p. 74.	Class: Selecting proper layout tools, hacksaw blades, method of holding stock, protecting v-ways, facing tool, methods of holding cutting tools, cutting speeds, direction of cut. Removing and disposing of chips, safety precaution, cutting fluids, file and abrasive cloth. Assignment: Selecting proper tools and equipment to perform task.	Observing students selecting proper tools and equipment to perform task.
Laying out stock with a: a. Square b. Scale c. Hermaphrodite Calipers d. Surface Gauge e. Dividers f. Scriber g. Center Punch Operating lathe to produce a shoulder to .001 of an inch.	Demonstration	Tools: Square Scale Hermaphrodite Calipers Surface Gauge Dividers Scriber Center Punch Materials: Cold Roll Steel	Laying out stock. Operating lathe to turn stock to produce a shoulder to .001 of an inch. Reading Units 52, 53 and 54, Engine Lathe Operations, Whipple and Baudek, pp. 79-83. Answer questions at end of units.	Observing students laying out and operating lathe to turn stock to produce a shoulder to .001 of an inch. Checking students progress with a written test.
Removing burrs from finished work with: a. File b. Abrasive Cloth		Tools: Lathe Materials: Engine Lathe Operations, Whipple and Baudek, pp. 82.		

TASK NO. 6: DRILLING STOCK ON LATHE TO PRODUCE A HOLE TO .005 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading Unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observe students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Reading graduations on tailstock spindle to determine depth.	Demonstration	Tools: Lathe	Reading graduation on tailstock spindle to determine depth.	Checking with written or oral quiz.
Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Demonstration	Tools: Chalkboard Chalk Materials: Decimal equivalent chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Checking with written or oral quiz. Calculating teacher prepared problems.
Selecting proper drill Selecting methods of holding drill. Selecting proper cutting fluids for various metals.	Demonstration Lecture	Tools: Drill Press Drill Vise Lubricant Materials: Cold Roll Steel Lubricant	Selecting proper drill, methods of holding drill and proper cutting fluids for various metals.	Checking with written or oral quiz.
Mounting Drill. Operating lathe to produce a hole to .005 of an inch. Removing burrs from work with an old drill.	Demonstration Teacher prepared video tape recording	Tools: Drill Jacobs Chuck Lathe Stock Materials: Engine Lathe Operations, Whipple and Baudek, p. 101.	Operating lathe to drill stock to produce a hole to .005 of an inch. Reading Units 65, 66, 67 and 68. Engine Lathe Operations, Whipple and Baudek, pp. 96-103. Answer question at end of units.	Observing students operating lathe to drill stock to produce a hole to .005 of an inch. Checking students progress with a written test.

TASK NO. 7: REAMING STOCK ON LATHE TO PRODUCE A FINISHED HOLE TO .001 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Measuring stock with an inside micrometer to determine size.	Demonstration Film	Tools: Inside Micrometer Film: "Tools and Rules for Precision Measuring," 30 min., Starrett.	Measure stock with inside micrometer.	Check measurements.
Determining fractional and decimal equivalents from charts Computing speeds for various metals. Applying knowledge of decimals.	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal Equivalent Chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Checking with written or oral quiz. Calculating teacher prepared problems.
Selecting proper reamer. Selecting methods of holding reamer.	Demonstration Lecture	Tools: Reamer Holding Device Materials: Engine Lathe Operations, Whipple and Baudek, p. 104.	Selecting proper reamer and methods of holding reamer.	Checking with written or oral quiz Observation
Mounting Reamer. Operating lathe to produce a finished hole. Removing burrs from finished work with: a. File b. Abrasive Cloth	Demonstration Teacher prepared video tape recording	Tools: Reamer Holding Device Materials: Engine Lathe Operations, Whipple and Baudek, p. 104.	Operating lathe to ream stock to produce a finished hole to .001 of an inch. Reading units 69 and 70, Engine Lathe Operations, Whipple and Baudek, pp. 103-105. Answer questions at end of units.	Observing students operating lathe to ream stock to produce a finished hole to .001 of an inch. Checking students progress with a written test.

TASK NO. 8: BORING STOCK ON LATHE TO PRODUCE AN ENLARGED HOLE TO .001 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Measuring stock with an inside caliper and micrometer to determine size.	Demonstration	Tools: Inside Calipers Micrometer Materials: "Measurement," Delmar Publishers, Inc., p. 11.	Measuring stock with an inside caliper and micrometer to determine size.	Observing students measuring stock with an inside caliper and micrometer to determine size.
Applying knowledge of decimals	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal Equivalent Chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Checking with written or oral quiz. Calculating teacher prepared problems.
Selecting proper boring tool. Selecting methods of holding boring tool.	Demonstration	Tools: Boring Tool Work Holding Devices Materials: Lubricant	Selecting proper boring tool and methods of holding.	Checking with written or oral quiz. Observation.
Mounting boring tool. Operating lathe to produce an enlarged hole. Removing burrs from finished work with: a. File b. Abrasive Cloth	Demonstration	Tools: Boring Tool Material: Stock Engine Lathe Operations, Whipple and Baudek, p. 106.	Operating lathe to bore stock to produce an enlarged hole to .001 of an inch. Reading units 71 and 72, Engine Lathe Operations, Whipple and Baudek, pp. 105-108.	Observing operating lathe to bore stock to produce an enlarged hole to .001 of an inch. Checking student with a written test.

TASK NO. 9: COUNTERBORING STOCK ON LATHE TO PRODUCE A RECESSED HOLE TO .005 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Measuring stock with a rule or scale to determine length.	Demonstration	Tools: Rule Scale Materials: Stock to be measured	Class: Measuring stock with a rule or scale to determine length. Assignment: Reading unit #6, General-Industrial Machine Shop, Johnson, pp. 70-73.	Observing students in measuring stock with a scale or rule to determine length. Checking students on assignment given.
Applying knowledge of decimals	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal Equivalent Chart, Shop Arithmetic, Delmar Publishers Inc., p. 88.	Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Checking with written or oral quiz. Calculating teacher prepared problems.
Selecting proper counterboring tool. Selecting method of holding tool.	Demonstration Lecture	Tools: Counterboring Tool Work Holding Device Materials: Stock	Selecting proper counterboring tool and method of holding.	Observing students selecting proper counterboring tool and method of holding.
Mounting: a. Counterboring tool in tailstock. b. Boring bar in tool holder. Operating lathe to produce a recessed hole. Removing burrs from finished work with: a. File b. Abrasive Cloth	Demonstration Teacher prepared video tape recording	Tools: Counterboring Tool Boring Bar Materials: Stock Engine Lathe Operations, Whipple and Baudek, p. 106.	Operating lathe to counterbore stock to produce a recessed hole to .005 of an inch. Assignment: Reading units 71 and 72, Engine Lathe Operations, Whipple and Baudek, pp. 105-108.	Observing students operating lathe to produce a recessed hole to .005 of an inch. Checking students with written test.

TASK NO. 10: PARTING STOCK ON LATHE TO PRODUCE A PIECE WITHIN 1/32 OF AN INCH IN LENGTH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Measuring stock with a rule or scale to determine length. Assignment: Reading Unit #6, General-Industrial Machine Shop, Johnson, pp. 70-73.	Observing students in measuring stock with a scale or rule to determine length. Checking students on assignment given.
Measuring stock with outside caliper to determine size	Demonstration Film	Tools: Outside Calipers Scale Stock Micrometer Film: "Tools and Rules for Precision Measuring," 30 min., Starrett.	Measuring stock with an outside caliper, vernier caliper, scale and micrometer.	Checking with written or oral quiz. Observation.
Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal Equivalent Chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Class: Computing fractional equivalents of decimals, automatic feed and cutting speeds for various metals. Applying knowledge of fractional parts of an inch and applying knowledge of decimals. Assignment: Shop Arithmetic, Delmar Publishers, Inc., Unit 11, pp. 24-25.	Checking students with a written test.
Selecting proper parting tool. Selecting methods of holding parting tool.	Demonstration Lecture	Tools: Parting Tool Materials: Engine Lathe Operations, Whipple and Baudek, p. 95.	Selecting proper parting tool and method of holding.	Observing students selecting proper parting tool and method of holding.
Mounting parting tool in holder in tool post and adjust point. Operating lathe to produce a piece within 1/32 of an inch in length. Removing burrs from finished work with: a. File b. Abrasive Cloth	Demonstration Teacher prepared video tape recording	Tools: Lathe and Parting Tool Engine Lathe Operations, Whipple and Baudek, p. 95.	Operating lathe to part stock on lathe to produce a piece within 1/32 of an inch in length. Reading units 49, 50 and 64, Engine Lathe Operations, Whipple and Baudek, pp. 77-78 and 95-96.	Observing students operating lathe to part stock on lathe to produce a piece within 1/32 of an inch in length. Checking students with written test.

TASK NO. 10: PARTING STOCK ON LATHE TO PRODUCE A PIECE WITHIN 1/32 OF AN INCH IN LENGTH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Measuring stock with a rule or scale to determine length. Assignment: Reading Unit #6, General-Industrial Machine Shop, Johnson, pp. 70-73.	Observing students in measuring stock with a scale or rule to determine length. Checking students on assignment given.
Measuring stock with outside caliper to determine size	Demonstration Film	Tools: Outside Calipers Scale Stock Micrometer Film: "Tools and Rules for Precision Measuring," 30 min., Starrett.	Measuring stock with an outside caliper, vernier caliper, scale and micrometer.	Checking with written or oral quiz. Observation.
Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal Equivalent Chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Class: Computing fractional equivalents of decimals, automatic feed and cutting speeds for various metals. Applying knowledge of fractional parts of an inch and applying knowledge of decimals. Assignment: Shop Arithmetic, Delmar Publishers, Inc., Unit 11, pp. 24-25.	Checking students with a written test.
Selecting proper parting tool. Selecting methods of holding parting tool.	Demonstration Lecture	Tools: Parting Tool Materials: Engine Lathe Operations, Whipple and Baudek, p. 95.	Selecting proper parting tool and method of holding.	Observing students selecting proper parting tool and method of holding.
Mounting parting tool in holder in tool post and adjust point. Operating lathe to produce a piece within 1/32 of an inch in length. Removing burrs from finished work with: a. File b. Abrasive Cloth	Demonstration Teacher prepared video tape recording	Tools: Lathe and Parting Tool Engine Lathe Operations, Whipple and Baudek, p. 95.	Operating lathe to part stock on lathe to produce a piece within 1/32 of an inch in length. Reading units 49, 50 and 64, Engine Lathe Operations, Whipple and Baudek, pp. 77-78 and 95-96.	Observing students operating lathe to part stock on lathe to produce a piece within 1/32 of an inch in length. Checking students with written test.

TASK NO. 11: NECKING STOCK ON LATHE TO PRODUCE A NECKED SHAPE TO 1/32 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Measuring with rule or scale to determine length.	Demonstration	Tools: Rule or Scale Materials: Stock to be measured	Class: Measuring stock with a rule or scale to determine length. Assignment: Reading unit #6, General-Industrial Machine Shop, Johnson, pp. 70-73.	Observing students in measuring stock with a scale or rule to determine length. Checking students on assignment given.
Measuring with outside callipers to determine size.	Demonstration	Tools: Outside Callipers Materials: "Measurement," Delmar Publishers, Inc. p. 11.	Measuring stock with an outside caliper, vernier caliper, scale and micrometer.	Checking with written or oral test. Calculating teacher prepared problems.
Applying knowledge of fractional parts of an inch.	Lecture	Tools: Chalkboard Chalk Materials: Shop Arithmetic, Delmar Publishers, Inc. Albany 1, New York.	Class: Computing fractional equivalents of decimals, automatic feed and cutting speeds for various metals. Applying knowledge of fractional parts of an inch and applying knowledge of decimals. Assignment: Shop Arithmetic, Delmar Publishers, Inc., unit 11, pp. 24-25.	Checking students with a written test.
Selecting proper necking tool. Selecting methods of holding cutting tools.	Demonstration Lecture	Tools: Necking Tool Materials: Engine Lathe Operations, Whipple and Baudek, p. 95.	Selecting proper necking tool and methods of holding.	Observing students selecting proper necking tool and methods of holding.
Mounting cutting tool. Operating lathe to produce a faced surface. Removing burrs from finished work with: a. File b. Abrasive Cloth	Demonstration Demonstration Teacher prepared video tape recording	Tools: Lathe Necking Tool Materials: Engine Lathe Operations, Whipple and Baudek, p. 95.	Operating lathe to neck stock to produce a necked shape to 1/32 of an inch. Assignment: Reading units 52, 53, and 54, Engine Lathe Operations, Whipple and Baudek, pp. 74-83. Answer questions at end of units.	Observing students operating lathe to neck stock to produce a necked shape to 1/32 of an inch. Checking student with a written test.

TASK NO. 12: FILING STOCK ON LATHE TO PRODUCE A FINISHED SURFACE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test reading assignment.
Measuring with micrometer to determine size.	Demonstration Film	Tools: Micrometer Film: "Tools and Rule for Precision Measuring," 30 min., Starrett.	Measuring stock with outside caliper, vernier caliper, scale and micrometer	Checking with written or oral quiz. Observation.
Applying knowledge of decimals.	Lecture	Tools: Chalk Chalkboard Materials: Shop Arithmetic, Delmar Publishers, Inc., Albany 1, New York.	Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Checking with written or oral quiz. Calculating teacher prepared problems.
Selecting proper file. Selecting proper abrasive cloth.	Demonstration Video Tape Recorder	Tools: Files (assortment) Abrasive Cloth	Selecting proper file.	Observing students selecting proper tools and equipment to perform task.
Operating lathe to produce a finished surface with file. Removing burrs from finished work with: a. File b. Abrasive Cloth	Demonstration Teacher prepared video tape recording	Tools: Proper File Materials: Engine Lathe Operations, Whipple and Baudek, p. 85.	Operating lathe to file stock to produce a finished surface. Reading unit 56, Engine Lathe Operations, Whipple and Baudek, p. 85.	Observing students operating lathe to file stock to produce a finished surface. Checking students with a written test.

TASK NO. 13: MACHINING STOCK ON SHAPER TO PRODUCE A FLAT SURFACE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Measuring with scale or rule to determine length.	Demonstration	Tools: Rule or Scale Materials: Stock to be measured	Class: Measuring stock with a rule or scale to determine length. Assignment: Reading unit #6, General-Industrial Machine Shop, Johnson, pp. 70-73.	Observing students in measuring stock with a scale or rule to determine length. Checking students on assignment given.
Reading graduations on tool head micrometer micrometer collar to determine depth of cut.		Tools: Shaper Materials: Shaper Work, Delmar Publishers, Inc., pp. 195-196.	Reading graduations on tool head, micrometer collar to determine depth of cut.	Observing students reading graduations.
Applying knowledge of fractional parts of an inch. Applying knowledge of decimals	Lecture	Tools: Chalk Chalkboard Materials: Shop Arithmetic, Delmar Publishers, Inc., Albany 1, New York.	Class: Computing fractional equivalents of decimals, automatic feed and cutting speeds for various metals. Applying knowledge of fractional parts of an inch and applying knowledge of decimals. Assignment: Shop Arithmetic, Delmar Publishers, Inc., unit 11, pp. 24-25.	Checking students with a written test.
Selecting layout tools. Selecting proper method of mounting work. Practicing proper safety precautions.	Demonstration Lecture	Tools: Layout Tools Shaper Vise and Accessories Materials: Stock Shaper Work, Delmar Publishers, Inc., Albany 1, New York.	Selecting layout tools, cutting tool, and proper method of mounting work.	Observing students selecting layout tools, cutting tool and proper method of mounting work.

Task No, 13 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Mounting stock. **Mounting cutting tool.** **Adjusting length of stroke.** **Adjusting position of ram.** **Adjusting ram speed and feed.** **Aligning cutting tool.** **Setting depth of cut** **Operating shaper to produce a flat surface.** **Removing burrs from finished work with:** **a. File** **b. Abrasive Cloth**	**Demonstration** **Teacher Prepared Video Tape Recording**	**Tools:** **Shaper** **File** **Square** **Surface Gauge** **Materials:** **Stock** **Shaper Work, Delmar Publishers, Inc., pp. 190-195.**	**Operating shaper to machine stock to produce a flat surface.** **Reading page 53(a), Shaper Work, Delmar Publishers, Inc., Albany, New York, pp. 189-209.**	**Observing students operating shaper to machine stock to produce a flat surface.** **Checking students with a written test.**

TASK NO. 14: MACHINING STOCK ON SHAPER TO PRODUCE TWO PARALLEL SURFACES TO .005 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Reading graduations on cross feed screw to determine depth of cut.	Demonstration	Tools: Shaper Materials: Shaper Work, Delmar Publishers, Inc., pp. 195-196.	Measuring stock with an outside caliper, vernier caliper, scale and micrometer.	Checking with written or oral quiz. Observation.
Measuring with micrometer to determine size.			Class: Measuring stock with a rule or scale to determine length. Assignment: Reading unit 6, General-Industrial Machine Shop, Johnson, pp. 70-73.	Observing students in measuring stock with a scale or rule to determine length. Checking students on assignment given.
Applying knowledge of decimals.	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal Equivalent Chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Checking with written or oral quiz Calculating teacher prepared problems.
Selecting layout tools. Selecting proper cutting tool. Selecting proper method of mounting work. Practicing proper safety precautions.	Demonstration Lecture	Tools: Layout Tools Shaper Vise and Accessories Material: Stock Shaper Work, Delmar Publishers, p. 199.	Selecting layout tools, cutting tool, and proper method of mounting work.	Observing students selecting layout tools, cutting tool and proper method of mounting work.
Mounting stock. Mounting cutting tool. Adjusting length of stroke. Adjusting position of ram. Adjusting ram speed and feed. Aligning cutting tool. Setting depth of cut Operating shaper to produce two parallel surfaces to .005 of an inch. Removing burrs with file or abrasive cloth.	Demonstration Teacher prepared video tape recording.	Tools: Shaper Materials: Shaper Work, Delmar Publishers, pp. 190-203.	Operating shaper to produce two parallel surfaces to .005 of an inch. Assignment: Reading page 53(a), Shaper Work, Delmar Publishers, Inc., Albany, New York, pp. 189-209.	Observing students operating shaper to produce two parallel surfaces to .005 of an inch. Checking students with a written test.

TASK NO. 15: DRILLING STOCK ON DRILL PRESS TO PRODUCE A HOLE TO .005 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material. and laying out stock. Paper and pencil test on reading assignment.
Measuring with rule or scale to determing length.	Demonstration	Tools: Rule or Scale Materials: Stock to be measured	Class: Measuring stock with a rule or scale to determine length. Assignment: Reading unit 6, General-Industrial Machine Shop, Johnson, pp. 70-73.	Observing students in measuring stock with a scale or rule to determine length. Checking students on assignment given.
Determining decimal equivalent of fractions from charts.	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal Equivalent Chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Checking with written or oral quiz. Calculating teacher prepared problems.
Selecting layout tools. Selecting proper drill. Selecting proper speeds. Selecting method of holding work. Aligning work to prevent drilling in holding devices. Practicing safety precautions.	Demonstration	Tools: Drill Press Vise Drill Layout Tools Scale Materials: Drill Press Work, Delmar Publishers, Inc., Albany 1, New York.	Selecting layout tools. Selecting proper drill. Selecting proper speeds. Selecting method for holding work. Aligning work to prevent drilling in holding devices.	Observing students selecting layout tools, drill, speeds, method for holding and aligning drill.
Laying out stock with: a. Rule b. Dividers c. Scriber d. Center Punch Mounting drill in spindle. Adjusting controls to obtain proper spindle speed. Mounting holding device. Mounting work in holding device.	Demonstration Teacher prepared video tape recording	Tools: Drill Press Vise Drill Layout Tools Scale Materials: Drill Press Work, Delmar Publishers, Inc., Albany 1, New York.	Operating drill press to drill stock to produce a hole to .005 of an inch. Read unit 1, p. 18, Drill Press Work, Delmar Publishers, Inc., Albany, New York, pp. 20-23.	Observing students operating drill press to drill stock to produce a hole to .005 of an inch. Checking students with a written test.

Task No. 15 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Adjusting depth stop for specific hole depth. Positioning stop blocks for multiple drilling of parts. Centering work with respect to the spindle. Aligning center punch mark with drill. Operating drill press to produce hole. Removing burrs from finished work with: a. File b. Abrasive Cloth				

TASK NO. 16: REAMING A HOLE ON DRILL PRESS TO PRODUCE A FINISHED HOLE TO .001 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Measuring inside diameter of hole with: a. Inside Micrometer b. Plug Gauge c. Telescope Gauge	Demonstration Teacher Prepared Video Tape Recording	Tools: Inside Micrometer Plug Gauge Telescope Gauge Stock Drill Press Vise Drill Layout Tools Scale Materials: Drill Press Work, Delmar Publishers, Inc., Albany, New York, pp. 20-23.	Measuring inside diameter of hole with: a. Inside Micrometer b. Plug Gauge c. Telescrope Gauge	Observing students measuring with inside micrometer, plug gage and telescope gage.
Apply the knowledge of decimals	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal equivalent chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Checking with written or oral quiz. Calculating teacher prepared problems.
Selecting proper reamer according to specifications. Selecting proper speeds. Practicing safety precautions Selecting abrasive cloth for removing burrs.	Demonstration Lecture	Tools: Reamer	Selecting proper reamer. Selecting proper speeds. Selecting method for holding work. Aligning work to prevent drilling in holding devices.	Observing student selecting layout tools, drill, speeds, method for holding and aligning drill.
Mounting reamer in spindle: a. Straight b. Taper Shank Adjusting controls to obtain proper spindle speed. Adjusting depth stop for specific hole depth. Operating drill press to produce finished hole to .001 of an inch. Removing burrs from finished work with: a. Old Drill b. Abrasive Cloth	Demonstration Teacher prepared video tape recording	Tools: Reamer Materials: Drill Press Work, Delmar Publishers, Inc., pp. 31-32.	Reaming a hole in a drill press to produce a finished hole to .001 of an inch. Measuring inside diameters of holes with inside micrometers, plug gauge and telescope gauge. Reading units IT21 and IP21, Drill Press Work, Delmar Publishers, Inc., pp. 29-32.	Observing students reaming hole in drill press to .001 of an inch and measuring inside diameters of holes. Checking students with a written test.

TASK NO. 17: SPOT FACING A HOLE ON DRILL PRESS TO PRODUCE A FINISHED SURFACE TO .005 OF AN INCH.

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints.	Class: Reading blueprints while teacher explains.	Observing students in selecting material and laying out stock.
			Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Paper and pencil test on reading assignment.
Measuring stock with micrometer to determine size.	Demonstration Lecture	Tools: Micrometer Materials:	Measuring stock with an outside caliper, vernier caliper, scale and micrometer.	Checking with written or oral quiz. Observation
Applying knowledge of decimals.	Lecture	Tools: Chalkboard Chalk Materials: Shop Arithmetic, Delmar Publishers, Inc., Albany 1, New York.	Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Checking with written or oral quiz. Calculating teacher prepared problems.
Selecting proper spot facing tool. Selecting proper speeds Practicing safety precautions Selecting file for removing burrs.	Demonstration	Tools: Spot Facing Tool Micrometer Layout Tools Shaper Vise and Accessories Materials: Drill Press Work, Delmar Publishers, Inc., pp. 33-35.	Selecting proper spot facing tool and speeds.	Observing students selecting proper spot facing tool and speeds.
Mounting spotfacing tool. Adjusting controls to obtain proper spindle speed. Adjusting depth stop. Centering work. Operating drill press. Removing burrs.	Demonstration. Teacher prepared video tape recording.	Tools: Spotfacing Tool Micrometer Shaper File Square Surface Gauge Materials: Drill Press Work, Delmar Publishers, Inc., pp. 36-39.	Spot facing a hole on drill press to produce a finished surface to .005 of an inch. Reading units I-T22 and I-P22, Drill Press Work, Delmar Publishers, Inc., pp. 33-37.	Observing students spot facing a hole on drill press to produce a finished surface to .005 of an inch. Checking students with a written test.

TASK NO. 18: COUNTERSINKING ON DRILL PRESS TO PRODUCE A FASTENER RECEIVER HOLE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Selecting proper countersinking tool. Selecting proper speeds. Practicing proper safety precautions. Selecting abrasive cloth for removing burrs.	Demonstration	Tools: Countersinking Tool Layout Tools Shaper Vise and Accessories Materials: Drill Press Work, Delmar Publishers, Inc., p. 29.	Selecting proper countersinking tool. Selecting proper speeds. Practicing proper safety precautions. Selecting abrasive cloth for removing burrs.	Observing students selecting proper countersinking tool, speeds, abrasive cloth and practicing safety precautions.
Mounting countersinking tool. Adjusting controls to obtain proper spindle speed. Adjusting depth stop. Operating drill press. Checking depth of countersink with fastener. Removing burrs.	Demonstration Teacher prepared video tape recording.	Tools: Countersinking Tool Shaper Materials: Drill Press Work, Delmar Publishers, Inc. p. 38-39.	Countersinking on drill press to produce a fastener receiver hole. Reading units I-T22 and I-P22, Drill Press Work, Delmar Publishers, Inc., pp. 35-39.	Observing students countersinking on drill press to produce a fastener receiver hole. Checking students with a written test.

TASK No. 19: COUNTERBORING A HOLE ON DRILL PRESS TO PRODUCE AN ENLARGED HOLE TO .005 OF AN INCH.

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Measuring stock with vernier caliper, rule and micrometer	Demonstration Film	Tools: Outside Calipers Scale Stock Micrometer Film: "Tools and Rules for Precision Measuring," 30 min., Starrett	Measuring stock with an outside caliper, vernier caliper, scale and micrometer.	Checking with written or oral quiz. Observation.
Applying knowledge of decimals	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal Equivalent Chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Determining fractional and decimal equivalents from charts. Computing speeds for various metals. Applying knowledge of decimals.	Checking with written or oral quiz. Calculating teacher prepared problems.
Selecting proper bounterboring tool. Selecting proper speeds. Practicing proper safety precautions. Selecting abrasive cloth.	Demonstration	Tools: Counterboring tool Layout Tools Shaper Vise Material: Drill Press Work, Delmar Publishers, Inc., pp. 36-37.	Selecting proper counterboring tool. Selecting proper speeds. Practicing proper safety precautions. Selecting abrasive cloth.	Observing students selecting counterboring tool and proper speed.
Mounting counterboring tool. Adjusting controls to obtain proper spindle speed. Adjusting depth stop. Operating drill press. Removing burrs.	Demonstration Teacher prepared video tape recording.	Tools: Counterboring tool Materials: Drill Press Work, Delmar Publishers, Inc., pp. 36-37.	Counterboring a hole on drill press to produce an enlarged hole to .005 of an inch. Reading units I-T21 and I-P21, Drill Press Work, Delmar Publishers, Inc., pp. 29-32.	Observing students counterboring a hole on drill press to produce an enlarged hole to .005 of an inch. Checking students with a written test.

TASK NO. 20: GRINDING STOCK ON BENCH GRINDER TO REMOVE EXCESS METAL.

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprint	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Measuring with outside calipers.	Demonstration Film	Tools: Outside Calipers Scale Stock Micrometer Film: "Tools and Rules for Precision Measuring," 30 min., Starrett	Measuring stock with outside caliper, vernier caliper, scale and micrometer.	Checking with written or oral quiz. Observation.
Selecting proper grinding wheel. Selecting abrasive cloth Practicing proper safety precautions when operating grinder. a. Wearing eye protection. b. Wearing appropriate clothing. c. Removing all tools before starting machine. d. Making adjustments after machine has stopped. e. Using adequately sharpened cutting tools. f. Maintaining all safety guards in place.	Demonstration	Tools: Grinding Wheels Materials: Lathe Work, Delmar Publishers, Inc., pp. 153-156.	Selecting proper grinding wheel. Selecting abrasive cloth. Practicing proper safety precautions when operating grinder.	Observing students selecting proper grinding wheel and abrasive cloth also practicing proper safety precautions.
Operating a grinder to remove excess metal. Removing burrs from finished work with: a. File b. Abrasive Cloth	Demonstration Teacher prepared video tape recording.	Tools: Grinder Gauge Goggles Wheeldresser Materials: Lathe Work, Delmar Publishers, Inc., pp. 151-160.	Grinding stock on bench grinder to remove excess metal. Reading units, I-T50 and I-T50, Lathe Work, Delmar Publishers, Inc., pp. 53-60.	Observing students grinding stock on bench grinder to remove excess metal. Checking students with a written test.

TASK NO. 21: GRINDING TOOLS ON BENCH GRINDER

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading working drawing, blueprint or text to determine angles tools are to be sharpened.	Demonstration	Tools: Scale Materials: Working Drawings Blueprints Texts	Reading working drawing, blueprint or text to determine angles tools are to be sharpened.	Written or oral test.
Checking drill angles with drill gauge. Checking angle of center punch with center gauge.	Demonstration	Tools: Drill Gauge Drill Center Punch Center Gage Grinder Materials: Machine Shop, Johnson, pp. 197-202.	Checking drill angles with drill gauge. Checking angles of center punch with center gauge.	Written or oral test.
Applying knowledge of angles.	Demonstration	Tools: Gauges Materials: Measurement, Delmar Publishers, Inc., pp. 46-48.	Applying knowledge of angles.	Observing students applying knowledge of angles when grinding tools.
Grinding scriber to correct point. Mounting drill in drill bit attachment. Grinding drill bits to specified angles and clearance. Grinding lathe tools on grinder to correct angles and clearances. Grinding various shaped chisels on a grinder to correct angles. Grinding center punch to correct angle.	Demonstration Teacher prepared video tape recording. Film.	Tools: Grinder Cutter Bit Blanks Tool Gauge Templates or Center Gauge Goggles Materials: Lathe Work, Delmar Publishers, Inc., pp. 161-164. Film: "Grinding Cutter Bits," 20 min., free, black and white, South Bend Lathe.	Reading working drawing, blueprint or text to determine angles tools are to be sharpened. Checking drill angles with drill gauge. Checking angle of center punch with center gauge. Applying knowledge of angles.	Observing students performance listed under suggest student activities. Checking students with a written test.

TASK NO. 22: GRINDING STOCK ON SURFACE GRINDER TO PRODUCE A FLAT SURFACE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Reading graduation on vertical adjustment handwheel.	Demonstration	Tools: Grinder Materials: Machine Shop Theory and Practice, Wagener and Arthur, p. 218.	Reading graduation on vertical adjustment handwheel.	Observing students reading graduation on vertical adjustment handwheel.
Applying knowledge of decimals	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal equivalent chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Applying knowledge of decimals.	Checking students with a written test.
Selecting a grinding wheel.	Demonstration Lecture	Tools: Grinding Wheel Work Holding Device Materials: Machine Shop Theory and Practice, Wagener and Arthur, pp. 217-218.	Selecting a grinding wheel.	Observing students selecting grinding wheel, method of holding work, cutting fluid, longitudinal and crossfeeds for grinder and proper type of file.
Selecting method of holding work: a. Vise b. Clamps c. Magnetic Chuck			Selecting method of holding work: a. Vise b. Clamps c. Magnetic Chuck	
Selecting appropriate cutting fluids.			Selecting appropriate cutting fluids.	
Selecting proper longitudinal and cross feeds for grinder.			Selecting proper longitudinal and cross-feeds for grinder	
Practicing proper safety precautions when operating grinder: a. Wearing eye protection. b. Wearing appropriate clothing. c. Removing all tools before starting machine. d. Making adjustments after machine has stopped. e. Using adequately sharpened cutting tools. f. Maintaining all safety guards in place.			Practicing proper safety precautions.	
			Selecting proper type of file.	

Task No. 22 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Testing soundness of wheel by striking a light blow with a hammer. Mounting grinding wheel. Trueing and dressing wheel with trueing fixture. Mounting work. Aligning wheel with work. Setting depth of cut for roughing. Operating grinder. Adjusting power crossfeed for automatic operation. Applying cutting fluid. Setting depth of cut for finishing cut. Removing work. Removing burrs.	Demonstration Teacher prepared video tape recording.	Tools: Grinding Wheel Hammer Dressing Wheel Trueing Fixture Materials: Machine Shop Theory and Practice, Wagener and Arthur, pp. 217-221.	Operating grinder to produce a flat surface. Reading: Machine Shop Theory and Practice, Wagner and Arthur, p. 218.	Observing students operating grinder to produce a flat surface. Checking students with a written test.

TASK NO. 23: GRINDING STOCK ON SURFACE GRINDER TO PRODUCE TWO PARALLEL SURFACES TO .001 OF AN INCH.

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading Unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Reading graduations on vertical adjustment handwheel.	Demonstration	Tools: Grinder Materials: Machine Shop Theory and Practice, Wagener and Arthur, p. 218.	Reading graduation on vertical adjustment handwheel. Measuring stock with an outside caliper, vernier caliper, scale, and micrometer.	Observing students reading graduation on vertical adjustment handwheel. Checking with written or oral quiz. Observation.
Measuring stock with a micrometer to determine size	Demonstration Film	Tools: Micrometer Film: "Tools and Rules for Precision Measuring," 30 min., Starrett		
Applying knowledge of decimals.	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal equivalent chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Checking with written or oral quiz. Calculating teacher prepared problems.
Practicing safety precautions when operating grinder: a. Wearing eye protection. b. Wearing appropriate clothing. c. Removing all tools before starting machine. d. Making adjustments after machine has stopped. e. Using adequately sharpened cutting tools. f. Maintaining all safety guards. Selecting proper file.	Demonstration	Tools: Grinding Wheels Materials: Lathe Work, Delmar Publishers, Inc., pp. 153-156.	Practicing safety precautions. Selecting proper file.	Observing students practicing safety precautions and selecting proper file.
Aligning grinding wheel with work to be ground. Setting depth of cut for roughing cut. Operating surface grinder to produce two parallel surfaces to .001 of an inch.	Demonstration Teacher prepared video tape recording.	Tools: Grinder Materials: Machine Shop Theory and Practice, Wagener and Arthur, p. 218.	Operating grinder to produce two parallel surfaces to .001 of an inch. Reading: Machine Shop Theory and Practice, Wagener and Arthur, p. 218.	Observing students operating grinder to produce two parallel surfaces to .001 of an inch. Checking students with a written test.

TASK NO. 24: GRINDING STOCK ON SURFACE GRINDER TO PRODUCE TWO PERPENDICULAR SURFACES TO .001 OF AN INCH.

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork-Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Reading graduations on vertical adjustment handwheel.	Demonstration	Tools: Grinder Materials: Machine Shop Theory and Practice, Wagener and Arthur, p. 218.	Reading graduation on vertical adjustment handwheel.	Observing students reading graduation on vertical adjustment handwheel.
Measuring stock with a micrometer to determine size.	Demonstration Film	Tools: Micrometer Film: "Tools and Rules for Precision Measuring," 30 min., Starrett.	Measuring stock with an outside caliper, vernier caliper, scale and micrometer.	Checking with written or oral quiz. Observation.
Applying knowledge of decimals.	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal equivalent chart, Shop Arithmetic, Delmar Publishers, p. 24.	Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Checking with written or oral quiz. Calculating teacher prepared problems.
Selecting method of holding work: a. Vise b. Clamps c. Magnetic Chuck Practicing proper safety precautions when operating grinder. a. Wearing eye protection. b. Wearing appropriate Clothing. c. Removing all tools before starting machine. d. Making adjustments after machine has stopped. e. Using adequately sharpened cutting tools. f. Maintaining all safety guards in place. Selecting proper file	Demonstration	Tools: Work Holding Device Materials: Machine Shop Theory and Practice, Wagener and Arthur, pp. 217-218. Tools: Grinding Wheels Materials: Lathe Work, Delmar Publishers, Inc., pp. 153-156.	Selecting a grinding wheel. Selecting method of holding work: a. Vise b. Clamps c. Magnetic Chuck d. Selecting appropriate cutting fluids. Selecting proper longitudinal and crossfeeds for grinder. Practicing proper safety precautions. Selecting proper type of file. Selecting proper grinding wheel. Selecting abrasive cloth Practicing proper safety precautions when operating grinder.	Observing students selecting grinding wheel, method of holding work, cutting fluid, longitudinal and crossfeeds for grinder, proper type of file and abrasive cloth; also practicing proper safety precautions.

Task No. 24 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Mounting work on surface grinder with: a. Clamps b. Parallels c. Angle Plate d. Magnetic Chuck Operating surface grinder to produce two perpendicular surfaces to .001 of an inch.	Demonstration Teacher prepared video tape recording.	Tools: Grinder C-Clamp Magnetic Chuck Parallels Angle Plate Materials: *Machine Shop Theory and Practice*, Wagener and Arthur, pp. 218-219.	Operating grinder to produce two perpendicular surfaces. Reading: *Machine Shop Theory and Practice*, Wagener and Arthur, pp. 218-219.	Observing students operating grinder to produce a flat surface. Checking student with a written test.

TASK NO. 25: GRINDING STOCK ON SURFACE GRINDER TO PRODUCE AN ANGULAR SURFACE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Reading graduations on vertical adjustment handwheel. Measuring angular surfaces with a sine bar to determine an angle.	Demonstration	Tools: Grinder and Sine Bar Materials: Machine Shop Theory and Practice, Wagener and Arthur, p. 220-222.	Reading graduations on vertical adjustment handwheel. Measuring angular surfaces with a sine bar to determine an angle.	Observing students reading graduations on vertical adjustment handwheel and measuring angular surfaces with a sine bar.
Applying knowledge of decimals	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal equivalent chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Checking with written or oral quiz. Calculating teacher prepared problems.
Applying knowledge of angles.	Demonstration	Tools: Gauges Materials: Measurement, Delmar Publishers, Inc., pp. 46-48.	Applying knowledge of angles.	Observing students applying knowledge of angles when grinding tools.
Selecting method of holding work. Practicing safety precautions when operating grinder: a. Wearing eye protection. b. Wearing appropriate clothing. c. Removing all tools before starting machine. d. Making adjustments after machine has stopped. e. Using adequately sharpened cutting tools. f. Maintaining all safety guards in place.	Demonstration	Tools: Grinder Sine Bar Adjustable Chuck Plate Angle Plate C-Clamp Parallels Materials: Machine Shop Theory and Practice, Wagener and Arthur, pp. 219-222.	Selecting method of holding work. Practicing safety precautions.	Observing students selecting method of holding work.
Mounting work with sine bar and angle plate or adjustable chuck plate. Operating a grinder to produce an angular surface.	Demonstration Teacher prepared video tape recording.	Tools: Grinder Sine Bar Adjustable Chuck Plate Angle Plate C-Clamp Parallels Materials: Machine Shop Theory and Practice, Wagener and Arthur, pp. 219-222.	Operating grinder to produce an angular surface. Reading: Machine Shop Theory and Practice, Wagener and Arthur, pp. 219-222. Answering questions 1-20, p. 229.	Observing students operating grinder to produce an angular surface. Checking with written test.

TASK NO. 26: MACHINING STOCK ON A HORIZONTAL MILLING MACHINE TO PRODUCE A FLAT SURFACE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Measuring stock with rule or scale to determine length.	Demonstration	Tools: Rule or scale Materials: Stock to be measured	Class: Measuring stock with a rule or scale to determine length. Assignment: Reading unit 6, General-Industrial Machine Shop, Johnson, pp. 70-73.	Observing students in measuring stock with a scale or rule to determine length. Checking students on assignment given.
Applying knowledge of fractional parts of an inch. Computing spindle speed and feed according to type of material being machined.	Demonstration Lecture	Materials: Milling Machine Work, Delmar Publishers, Inc., Albany, New York, pp. 141-153.	Computing spindle speed and feed according to type of material being machined.	Checking students with written test.
Selecting proper method for holding stock to be machined. Selecting proper cutter for specific operation. Selecting (from charts) proper speeds and feeds for various cutters and materials. Selecting direction of cut. Removing and disposing of chips. Practicing proper safety precautions a. Wearing goggles or face shield b. Wearing appropriate apparel. c. Removing all tools before starting machine. d. Making adjustments after machine has stopped. e. Using only cutting tools which have been adequately sharpened. f. Maintaining all safety guards in place. Selecting proper type of file. Selecting abrasive cloth for removing burrs.	Lecture Demonstration	Tools: Milling Machine Vise Square Plain Milling Cutter Parallels Lead Mallet Surface Gauge Micrometers Outside Calipers Steel Rule Wrenches File Brush Wiping Cloth Round Steel Rod Chalk Materials: Milling Machine Work, Delmar Publishers, Inc., Albany, New York.	Selecting stock to be machined. Selecting proper cutting speeds and cutters. Practicing safety precautions.	Observing students performance.

Task No. 26 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Cleaning machine with rag and brush to obtain accurate set up. Mounting holding devices: a. Vises b. Clamps c. Jigs and Fixtures Mounting stock: a. Parallels b. Angle Plate c. Shims d. Step Block Mounting cutters, spacing and bearing collars on milling machine spindle. Adjusting controls to obtain proper speeds for various cutters and metals to be machined. Adjusting controls to obtain proper feeds for various cutters and materials. Aligning cutter with stock to be machined. Operating a horizontal milling machine to produce a flat surface. Removing stock from holding devices. Removing burrs from finished work with file and abrasive cloth.	Demonstration Teacher prepared video tape recording	Tools: Milling Machine Vise Square Plain Milling Cutter Parallels Lead Mallet Surface Gauge Micrometers Outside Calipers Steel Rule Wrenches File Brush Wiping Cloth Round Steel Rod Chalk Materials: Milling Machine Work, Delmar Publishers, Inc., Albany, New York, pp. 121-139.	Operating milling machine to produce a flat surface. Reading: Milling Machine Work, Delmar Publishers, Inc., Albany, New York, pp. 121-139.	Observing students operating milling machine to produce a flat surface. Evaluating the finished project.

TASK NO. 27: MACHINING STOCK ON A HORIZONTAL MILLING MACHINE TO PRODUCE SURFACES TO .001 OF AN INCH.

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading a blueprint while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment
Measuring stock with a rule or scale to determine length.	Demonstration	Tools: Rule or Scale Materials: Stock to be measured.	Class: Measuring stock with a rule or scale to determine length. Assignment: Reading unit 6, General-Industrial Machine Shop, Johnson, pp. 70-73.	Observing students in measuring stock with a scale or rule to determine length. Checking students on assignment given.
Measuring stock with a vernier caliper to determine size. Measuring stock with a micrometer to determine size. Reading graduations on vertical feed.	Demonstration Film	Tools: Vernier Caliper Film: "Tools and Rules for Precision Measuring," 30 min., Starrett. Tools: Milling Machine Plain Milling Cutter Materials: Machine Shop Operations and Setups, Porter, Lawshe and Lascoe, pp. 304-307.	Measuring stock with an outside caliper, vernier caliper, scale and micrometer. Reading graduations on vertical feed.	Checking with written or oral quiz. Observation Observing students reading graduations on vertical feed.
Computing spindle speed and feed according to type of material being machined. Determining fractional and decimal equivalent from charts. Computing fractional equivalents of decimals. Computing decimal equivalents of fractions.	Demonstration Lecture	Materials: Milling Machine Work, Delmar Publishers, Inc., Albany, New York, pp. 141-153.	Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.	Checking with written or oral quiz. Calculating teacher prepared problems.
Applying knowledge of fractional parts of an inch. Applying knowledge of decimals.	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal equivalent chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Computing spindle speed and feed according to type of material being machined.	Checking students with written test.
Laying out stock to be machined.				
Operating horizontal milling machine to produce parallel surfaces to .001 of an inch.	Demonstration Teacher prepared video tape recording	Tools: Milling machine Material: Machine Shop Operations and Setups, Porter, Lawshe and Lascoe, pp. 312-315.	Operating horizontal milling machine to produce parallel surfaces to .001 of an inch. Reading: Milling Machine Work, Delmar Publishers, inc., Albany, New York, pp. 121-139.	Observing students operating milling machine to produce surfaces to .001 of an inch.

TASK NO. 29: MACHINING STOCK ON A HORIZONTAL MILLING MACHINE TO PRODUCE A SHOULDER TO .001 OF AN INCH.

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Measuring stock with an outside caliper, vernier caliper, rule and micrometer.	Demonstration Film	Tools: Outside Calipers Scale Stock Micrometer Film: "Tools and Rules for Precision Measuring," 30 min., Starrett	Measuring stock with an outside caliper, vernier caliper, scale and micrometer.	Checking with written or oral quiz. Observation.
Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals.		Tools: Chalkboard Chalk Materials: Decimal equivalent chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Class: Computing fractional equivalents of decimals, automatic feed and cutting speeds for various metals. Applying knowledge of fractional parts of an inch and applying knowledge of decimals. Assignment: Reading Shop Arithmetic, Delmar Publishers, Inc., unit 11, pp. 24-25.	Checking students with a written test.
Selecting proper method for holding stock to be machined. Selecting proper cutter for specific operation. Selecting (from charts) proper speeds and feeds for various cutters and materials. Selecting direction of cut Removing and disposing of chips. Practicing proper safety precautions: a. Wearing goggles or face shield. b. Wearing appropriate apparel. c. Removing all tools before starting machine. d. Making adjustments after machine has stopped. e. Using only cutting tools which have been adequately sharpened. f. Maintaining all safety guards in place. Selecting proper type of file. Selecting abrasive cloth for removing burrs.	Lecture Demonstration	Tools: Milling Machine Vise Square Plain Milling Cutter Parallels Lead Mallet Surface Gauge Micrometers Outside Calipers Steel Rule Wrenches File Brush Wiping Cloth Round Steel Rod Chalk Materials: Milling Machine Work, Delmar Publishers, Inc., Albany, New York.	Selecting stock to be machined. Selecting proper cutting speeds, and cutters. Practicing safety precautions.	Observing student's performance.

Task No. 29 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Operating horizontal milling machine to produce a shoulder to .001 of an inch.	Demonstration Teacher prepared video tape recording	Tools: Milling Machine Shell Milling Cutter Stagger Tooth Cutter Depth Micrometer Vise. Materials: Machine Shop Operations and Setups, Porter, Lawshe, and Lascoe, pp. 310-312.	Operating horizontal milling machine to produce a shoulder to .001 of an inch. Reading: Milling Machine Work, Delmar Publishers, Inc., Albany, New York, pp. 175-177.	Observing students operating milling machine to produce a shoulder to .001 of an inch.

TASK 30: MACHINING STOCK ON A HORIZONTAL MILLING MACHINE TO PRODUCE AN ANGULAR SURFACE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the: specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment
Measuring angular surfaces with a sine bar to determine an angle.	Demonstration	Tools: Grinder Sine Bar Materials: Machine Shop Theory and Practice, Wagener and Arthur, pp. 220-222.	Reading graduations on vertical adjustment handwheel. Measuring angular surfaces with a sine bar to determine an angle.	Observing students reading graduations on vertical adjustment handwheel and measuring angular surfaces with a sine bar.
Applying knowledge of decimals. Applying knowledge of angles. Applying knowledge of fractional parts of an inch. Computing spindle speed and feed according to type of material being machined.	Demonstration Lecture	Tools: Chalkboard Chalk Materials: Decimal equivalent chart, Shop Arithmetic, Delmar Publishers, Inc., p. 24.	Determining fractional and decimal equivalents from chart. Computing speeds for various metals. Applying knowledge of decimals. Computing spindle speed and feed according to type of material being machined. Applying knowledge of angles	Checking with written or oral quiz. Calculating teacher prepared problems. Checking students with written test. Observing students applying knowledge of angles when grinding tools.
Selecting proper method for holding stock to be machined. Selecting proper cutter for specific operation. Selecting (from charts) proper speeds and feeds for various cutters and materials. Selecting direction of cut. Removing and disposing of chips. Practicing proper safety precautions: a. Wearing goggles or face shield. b. Wearing appropriate apparrel. c. Removing all tools before starting machine. d. Making adjustments after machine has stopped. e. Using only cutting tools which have been adequately sharpened. f. Maintaining all safety guards in place. Selecting proper type of file. Selecting abrasive cloth for removing burrs.	Lecture Demonstration	Tools: Milling Machine Vise Square Plain Milling Cutter Parallels Lead Mallet Surface Gauge Micrometers Outside Calipers Steel Rule Wrenches File Brush Wiping Cloth Round Steel Rod Chalk Materials: Milling Machine Work, Delmar Publishers, Inc., Albany, New York.	Selecting stock to be machined. Selecting proper cutting speeds, and cutters. Practicing safety precautions.	Observing students performance.

Task No. 30 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Operating a horizontal milling machine to produce an angular surface.	Demonstration Teacher prepared video tape recording.	Tools: Milling Machine Swivel Vise Bevel protractor Scale Shell Millin Cutter Stagger Tooth Cutter Materials: Machine Shop Operations and Setups, Porter, Lawshe and Lascoe, pp. 310-312.	Operating horizontal milling machine to produce an angular surface. Reading: Milling Machine Work, Delmar Publishers, Inc., Albany, New York, pp. 175-177.	Observing students operating milling machine to produce an angular surface.

TASK NO. 31: MACHINING STOCK ON A VERTICAL MILLING MACHINE TO PRODUCE A FLAT SURFACE.

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprint	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment
Measuring stock with rule or scale to determine length.	Demonstration	Tools: Rule or Scale Materials: Stock to be measured	Class: Measuring stock with a rule or scale to determine length. Assignment: Reading unit 6, General-Industrial Machine Shop, Johnson, pp. 70-73.	Observing students in measuring stock with a scale or rule to determine length. Checking students on assignment given.
Applying knowledge of fractional parts of an inch. Computing spindle speed and feed according to type of material being machined.	Demonstration Lecture	Materials: Milling Machine Work, Delmar Publishers, Inc., Albany, N.Y., pp. 141-153.	Computing spindle speed and feed according to type of material being machined.	Checking students with written test.
Selecting proper cutter	Demonstration Lecture	Tools: Vertical Milling Machine Vise Face Milling Shell Milling Cutter Shell End Mill Arbor Material: Machine Shop Operations and Setups, Porter, Lawshe and Lascoe, pp. 286, 307-308.	Selecting proper cutter.	Observing students selecting proper cutter. Teacher prepared questions based on text.

Task No. 31 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Mounting cutters, spacing and bearing collars on milling machine spindle. Adjusting controls to obtain proper speeds for various cutters and metals to be machined. Adjusting controls to obtain proper feeds for various cutters and materials. Aligning cutter with stock to be machined. Operating a horizontal milling machine to produce a flat surface. Removing stock from holding devices. Removing burrs from finished work with file and abrasive cloth.	Demonstration. Teacher prepared video tape recording.	Tools: Milling Machine Vise Square Plain Milling Cutter Parallels Lead Mallet Surface Gauge Micrometers Outside Calipers Steel Rule Wrenches File Brush Wiping Cloth Round Steel Rod Chalk Materials: Milling Machine Work, Delmar Publishers, Inc., Albany, New York., pp. 121-139.	Mounting cutter. Operating milling machine to produce a flat surface. Reading: Milling Machine Work, Delmar Publishers, Inc., Albany, New York, pp. 121-139.	Observing students mounting cutter. Observing students operating milling machine to produce a flat surface. Evaluating the finished project.

TASK NO. 32: MACHINING STOCK ON A VERTICAL MILLING MACHINE TO PRODUCE TWO PARALLEL SURFACES TO .001 OF AN INCH.

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Measuring stock with rule or scale to determine length.	Demonstration	Tools: Rule or Scale Materials: Stock to be measured	Class: Measuring stock with a rule or scale to determine length. Assignment: Reading unit 6, General-Industrial Machine Shop, Johnson, pp. 70-73.	Observing students in measuring stock with a scale or rule to determine length. Checking students on assignment given.
Applying knowledge of fractional parts of an inch. Computing spindle speed and feed according to type of material being machined.	Demonstration Lecture	Materials: Milling Machine Work, Delmar Publishers, Inc., Albany, N. Y., pp. 141-153.	Computing spindle speed and feed according to type of material being machined.	Checking students with written test.
Selecting proper cutter for specific operation.	Demonstration Lecture	Tools: Milling Machine Vise Square Plain Milling Cutter Parallels Lead Mallet Surface Gauge Micrometers Outside Calipers Steel Rule Wrenches File Brush Wiping Cloth Round Steel Rod Chalk Materials: Milling Machine Work, Delmar Publishers, Inc., Albany, New York.	Selecting proper cutter.	Observing students selecting proper cutter. Teacher prepared questions based on text.

Task No. 32 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Mounting cutters, spacing and bearing collars on milling machine spindle. Adjusting controls to obtain proper speeds for various cutters and metals to be machined. Adjusting controls to obtain proper feeds for various cutters and materials. Aligining cutter with stock to be machined. Operating a horizontal milling machine to produce a flat surface. Removing stock from holding devices. Removing burrs from finished work with file and abrasive cloth. Invert piece to machine other side.	Demonstration Teacher prepared video tape recording.	Tools: Milling Machine Vise Square Plain Milling Machine Parallels Lead Mallet Surface Gauge Micrometers Outside Calipers Steel Rule Wrenches File Brush Wiping Cloth Round Steel Rod Chalk Materials: Milling Machine Work, Delmar Publishers, Inc., Albany, New York, pp. 121-139.	Mounting cutter. Operating milling machine to produce a flat surface. Reading: Milling Machine Work, Delmar Publisher, Inc., Albany, New York, pp. 121-139.	Observing students mounting cutter. Observing students operating milling machine to produce a flat surface. Evaluating the finished project.

TASK NO. 33: MACHINING STOCK ON A VERTICAL MILLING MACHINE TO PRODUCE PERPENDICULAR SURFACES TO .001 OF AN INCH.

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Measuring stock with rule or scale to determine length.	Demonstration	Tools: Rule or Scale Materials: Stock to be measured	Measuring stock with an outside caliper, vernier caliper, scale and micrometer.	Checking with written or oral quiz. Observation.
Selecting proper method for holding stock to be machined. Selecting proper cutter for specific operation. Selecting (from charts) proper speeds and feeds for various cutters and and materials. Selecting direction of cut. Removing and disposing of chips. Practicing proper safety precautions a. Wearing goggles or face shield. b. Wearing appropriate apparel c. Removing all tools before starting machine. d. Making adjustments after machine has stopped. e. Using only cutting tools which have been adequately sharpened. f. Maintaining all safety guards in place. Selecting proper type of file. Selecting abrasive cloth for removing burrs.	Lecture Demonstration	Tools: Milling Machine Vise Square Plain Milling Cutter Parallels Lead Mallet Surface Gauge Micrometers Outside Calipers Steel Rule Wrenches File Brush Wiping Cloth Round Steel Rod Chalk Materials: Milling Machine Work, Delmar Publishers, Inc., Albany, New York.	Computing spindle speed and feed according to type of material being machined.	Checking students with written test.
Selecting proper cutter.	Demonstration Lecture	Tools: Vertical Milling Machine Vise End Milling Cutter Depth Micrometer Materials: Machine Shop Operations and Setup, Porter, Lawshe and Lascoe, pp. 308-309.	Selecting proper cutter.	Observing students selecting proper cutter. Identify the proper cutters on a paper and pencil test.

TASK NO. 34: MACHINING STOCK ON A VERTICAL MILLING MACHINE TO PRODUCE A SHOULDER TO .001 OF AN INCH.

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Demonstration	Tools: Scale Materials: Blueprints	Class: Reading blueprints while teacher explains. Assignment: Reading Unit #3, Metalwork Technology and Practice, Ludwig, pp. 27-33.	Observing students in selecting material and laying out stock. Paper and pencil test on reading assignment.
Measuring stock with rule or scale to determine length.	Demonstration	Tools: Rule or Scale Materials: Stock to be measured	Measuring stock with an outside caliper, vernier caliper, scale and micrometer.	Checking with written or oral quiz. Observation.
Selecting proper method for holding stock to be machined. Selecting proper cutter for specific operation. Selecting (from charts) proper speeds and feeds for various cutters and materials. Selecting direction of cut. Removing and disposing of chips. Practicing proper safety precautions a. Wearing goggles or face shield. b. Wearing appropriate apparel c. Removing all tools before starting machine. d. Making adjustments after machine has stopped. e. Using only cutting tools which have been adequately sharpened. f. Maintaining all safety guards in place. Selecting proper type of file. Selecting abrasive cloth for removing burrs.	Demonstration Lecture	Tools: Milling Machine Vise Square Plain Milling Cutter Parallels Lead Mallet Surface Gauge Micrometers Outside Calipers Steel Rule Wrenches File Brush Wiping Cloth Round Steel Rod Chalk Materials: Milling Machine Work, Delmar Publishers, Inc., Albany, New York.	Computing spindle speed and feed according to type of material being machined.	Checking students with written test.
Operating vertical milling machine to produce a shoulder to .001 of an inch.	Demonstration Teacher prepared video tape recording.	Tools: Milling Machine Shell Milling Cutter Stagger Tooth cutter Depth Micrometer V Vise Materials: Machine Shop Operations and Setups, Porter, Lawshe, and Lascoe, pp. 310-312.	Operating horizontal milling machine to produce a shoulder to .001 of an inch. Reading: Milling Machine Work, Delmar Publishers, Inc., Albany, New York, pp. 175-177.	Observing students operating milling machine to produce a shoulder to .001 of an inch. Teacher prepared written test to cover Tasks 26-34.

OCCUPATIONAL INFORMATION UNIT FOR MACHINING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
The employment outlook: 1. Local 2. National	Lecture. Overhead projector presentation.	Teacher-developed occupational information. Publication: Occupational Outlook Series, 1966-67 edition, Government Printing Office, 1966, Washington, D.C. Teacher-prepared visuals.	Visiting an office of the county and state employment service.	Written quiz.
Wage scale: 1. Local a. union (1) apprentice (2) journeyman (3) master b. non-union (1) entry wages (2) experienced 2. National a. union (1) apprentice (2) journeyman (3) master b. non-union (1) entry wages (2) experienced	Lecture. Presentation by local union representative. Overhead projector presentation.	Publication: Occupational Outlook Series, 1966-67 edition, Government Printing Office, 1966, Washington, D.C. Teacher-prepared visuals.	Reading the Occupational Outlook Handbook. Student-conducted survey of local wage scale at different levels of employment.	Written quiz. Oral report of individual survey.
The types of training available: 1. Apprenticeship programs 2. Technical or trade schools. 3. On-the-job 4. Military	Lecture.	Publication: Occupational Outlook Report Series - Employment Outlook In Machining Occupations, 1966-67 edition, Government Printing Office, 1966, Washington, D.C. Teacher-prepared visuals.	Writing letters to trade schools in order to determine opportunities for additional training.	Written quiz.
The working conditions experienced in the occupations.	Lecture.	Publication: Occupational Outlook Report Series - Employment Outlook In Machining Occupations, 1966-67 edition, Government Printing Office, 1966, Washington, D.C.	Visiting a machining industry and interviewing a machinist.	Written quiz. Oral report of interview.
The physical and mental characteristics needed for qualification for employment.	Lecture. Presentation by local employer.	Publication: Occupational Outlook Report Series - Employment Outlook In Machining Occupations, 1966-67 edition, Government Printing Office, 1966, Washington, D.C.	Writing for specific information concerning opportunities in the occupation of the metal forming and fabrication cluster.	Written quiz.

OCCUPATIONAL INFORMATION UNIT FOR MACHINING (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
The geographical location of employment.	Lecture.	Publication: Occupational Outlook Report Series - Employment Outlook In Machining Occupations, 1966-67 edition, Government Printing Office, 1966, Washington, D.C. Teacher-prepared visuals.	Reading the Occupational Outlook Handbook.	Written quiz.
The opportunities for advancement.	Lecture.	Publication: Occupational Outlook Report Series - Employment Outlook In Machining Occupations, 1966-67 edition, Government Printing Office, 1966, Washington, D.C.	Reading the Occupational Outlook Handbook.	Written quiz.
The advantages and disadvantages of the occupation: 1. Advantages 2. Disadvantages	Lecture.	Publication: Occupational Outlook Report Series - Employment Outlook In Machining Occupations, 1966-67 edition, Government Printing Office, 1966, Washington, D.C.	Reading the Occupational Outlook Handbook.	Written quiz.
The nature of the work involved in the occupation.	Lecture.	Publication: Occupational Outlook Report Series - Employment Outlook In Machining Occupations, 1966-67 edition, Government Printing Office 1966, Washington, D.C.	Visiting a machining industry and interviewing a machinist.	Written quiz. Oral presentation of visit.
The union involvement in the occupation.	Lecture. Presentation by local union representative.	Publication: Occupational Outlook Report Series - Employment Outlook In Machining Occupations, 1966-67 edition, Government Printing Office 1966, Washington, D.C.	Listening to a speaker from a trade union.	Written quiz. Class discussion based on presentation by union representative.

SHEET METAL WORK

TASK NO. 1: TRACING TEMPLATES ON SHEET METAL FOR CUTTING, BENDING AND JOINING SHEET METAL ITEMS

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Checking overall length of sheet metal with measuring tape. Checking gauge of sheet metal with sheet metal gauge or micrometer.	Demonstration Lecture Discussion	Measuring tape or rule Sheet Metal Gauge Sheet Metal	Measuring length and gage of sheet metal.	Teacher observations.
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide. Applying knowledge of decimals to add, subtract, multiply, and divide.	Lecture Handouts Discussion Chalkboard	Ludwig: Metal Work Technology and Practice, third edition, pp. 254, McKnight and McKnight, Publishers.	Interpreting drawing on page 254, Metal Work Technology and Practice. Adding, subtracting, multiplying and dividing fractions and decimals. Teacher made problems.	Teacher made test on adding, subtracting, multiplying and dividing fractions and decimals.
Scribing lines around templates with scriber.	Demonstration Student participation	Scribe Layout Fluid Template	Define the term - template. Tracing template on sheet metal. Read: pp. 58-59, Metal Work Technology and Practice.	Visual examination of students tracing templates.

TASK NO. 2: CUTTING SHEET METAL WITH HAND TOOLS TO PRODUCE A STRAIGHT CUT WITHIN 1/32 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece b. Type of operation c. Finish and accuracy required d. Kind of material	Lecture Overhead Handouts	Metalwork Technology and Practice, Ludwig Hand Processes, Delmar Publishers, pp. 18-20. Teacher Prepared Overlays.	Interpreting drawing on p. 254 - Ludwig, Metal Work, Technology and Practice. Interpreting teacher made blueprints. Reading: Metal Work Technology and Practice, Unit #3, pp. 27-33.	Test on interpreting blueprints, Teacher made. Observing students layout a piece of sheet metal. Completing questions at end of Unit #3.
Checking overall length of sheet metal with measuring tape. Checking gauge of sheet metal with sheet metal gauge or micrometer.		Rule Sheet Metal Gauge	Measuring length and gage of sheet metal.	Teacher observation.
Applying knowledge of fractions a. Adding fractions b. Subtracting fractions	Lecture Handouts Discussion Chalkboard	Ludwig: Metal Work Technology and Practice, third edition, pp. 254, McKnight and McKnight, Publishers.	Teacher made problems - adding and subtracting fractions.	Teacher made quiz on adding and subtracting fractions.
Laying out stock with a rule or scale.	Demonstration	Scribe Rule Layout Fluid	Laying-out a simple sheet metal project. Scribing lines on sheet metal.	Visual inspection of completed job.
Aligning sheet metal with shear blade for an accurate cut. Cutting sheet metal with straight snips to produce a straight cut within 1/32 of an inch.	Discussion Demonstration	Tin Snips Sheet Metal Metal Work Technology and Practice, Hand Processes, Delmar Publishers, pp. 29-32	Carefully cutting sheet metal with hand snips.	Visual inspection.
Removing burrs from sheet metal with: a. file	Demonstration	File Hand Processes, pp. 52-54.	Filing sharp edges from sheet metal.	Teacher observation, and project evaluation.
Selecting appropriate layout tool for task. Selecting most appropriate hand cutting tool for the task. Selecting appropriate file for task.	Exhibit of layout tools Class Discussion Lecture and Demonstration	Hand Processes, Delmar Publishers, pp. 8-12.	Identifying various layout tools in the shop. Read: Ludwig, Metal Work Technology and Practice, Units 5, 6, 7, and 8.	Answer questions at end of units 5, 6, 7, and 8. Identifying layout tools on a teacher prepared test.
Wearing gloves when handling sharp sheet metal.	Discussion	Gloves	Practicing safety measures when cutting sheet metal.	Checking safety measures visually or on a written quiz.

TASK NO. 3 CUTTING SHEET METAL WITH MACHINERY TO PRODUCE A STRAIGHT CUT WITHIN 1/32 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece b. Type of operation c. Finish and accuracy required d. Kind of material	Lecture Overhead Projector Handouts	Metal Work Technology and Practice, Ludwig, Unit #3. Hand Processes, Delmar Publishers, pp. 15-20. Teacher - Prepared Overlays.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Interpreting Teacher made blueprints. Read: Metal Work Technology and Practice, Unit #3, pp. 27-33.	Teacher prepared test on interpreting blueprints. Observing students laying out a piece of sheet metal. Completing questions at end of Unit #3.
Reading graduations on sheet metal machinery to determine specific dimensions.	Lecture Demonstration	Scale	Determine dimensions of metal to be cut.	Checking with a rule.
Applying knowledge of fractional parts of an inch to multiply, add, subtract, multiply, and divide.	Lecture Handouts Discussion Chalkboard	Metal Work Technology and Practice, p. 254.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Adding, subtracting, multiplying, and dividing fractions and decimals. Teacher made problems.	Teacher made test on adding, subtracting, multiplying and dividing fractions and decimals.
Laying out stock with a rule or scale.	Demonstration	Scribe Rule Layout Fluid	Laying out a simple sheet metal project. Scribing lines on sheet metal.	Visual inspection of the completed layout.
Aligning sheet metal with shear blade for an accurate cut.	Demonstration Lecture	Sheet Metal Squaring Shear	Cutting sheet metal with squaring shears.	Visual inspected of the completed job.
Cutting sheet metal with power operated squaring shears to produce a straight cut.	Demonstration Lecture	File Hand Processes, Delmar Publishers, pp. 29-32.	Cutting sheet metal with squaring shears.	Visual inspection of the cut.
Removing burrs from sheet metal with a file.	Demonstration	File Hand Processes, pp. 52-54.	Filing sharp edges from sheet metal.	Teacher observations and project evaluation.
Selecting appropriate layout tool for the task.	Exhibit of layout tools Class Discussion Lecture Demonstration	Hand Processes, pp. 8-12 File	Identifying various layout tools in the shop. Read: Metal Work Technology and Practice, Units 5, 6, 7, and 8.	Answer questions at end of Units 5, 6, 7, and 8. Identify layout tools on a teacher prepared test.
Wearing gloves when handling sheet metal.	Discussion	Gloves	Practicing safety measures when cutting sheet metal.	Checking safety measures visually or on a written quiz.

TASK NO. 4: CUTTING SHEET METAL WITH HAND TOOLS TO PRODUCE A CIRCULAR CUT WITHIN 1/32 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece b. Type of operation c. Finish and accuracy required d. Kind of material	Lecture Overhead Projector Handouts	Metal Work Technology and Practice, Ludwig, Unit #3 Hand Processes, Delmar Publishers, pp. 18-20. Teacher prepared overlays	Interpreting drawing on p. 254, Metal Work Technology and Practice. Interpreting teacher made blueprints. Read: Metal Work Technology and Practice, Unit #3, pp. 27-33.	Teacher prepared test on interpreting blueprints. Observing students laying out a piece of sheet metal. Completing questions at end of Unit #3.
Checking overall length of sheet metal with rule or tape. Checking gauge of sheet metal with sheet metal gauge or micrometer.	Demonstration Lecture Class Discussion	Measuring tape or rule Sheet Metal Gauge Sheet Metal	Measuring the length and gauge of sheet metal necessary for the job.	Teacher observation.
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide.	Lecture Handouts Discussion Chalkboard	Metal Work Technology and Practice, p. 254.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Adding, subtracting, multiplying, and dividing fractions and decimals. Teacher made problems.	Teacher made test on adding, subtracting, multiplying and dividing fractions and decimals.
Laying out stock with a rule or scale.	Demonstration	Scribe Rule Layout Fluid	Laying out a simple sheet metal project. Scribing lines on sheet metal.	Visual inspection of the completed layout.
Cutting sheet metal with aviation snips.	Overhead Projector	Aviation Snips Hand Processes, pp. 29-32 Teacher Prepared Overlays Sheet Metal Dividers	Laying out stock for a circular cut using dividers. Cutting out stock with aviation snips. Read: Metal Work Technology and Practice, pp. 256-258.	Observing students performing cutting operations
Removing burrs from sheet metal with a file.	Demonstration	File Hand Processes, pp. 52-54	Filing sharp edges from sheet metal.	Teacher observation and project evaluation.
Selecting appropriate layout tool for the task. Selecting the appropriate file for the task. Selecting the appropriate cutting tool.	Exhibit of layout tools Class Discussion Lecture Demonstration	Hand Processes, pp. 8-12 Hand Processes, p. 31.	Identifying various layout tools in the shop. Read: Metal Work Technology and Practice, Units 5, 6, 7, and 8.	Answer questions at end of units 5, 6, 7, and 8.

TASK NO. 5: CUTTING SHEET METAL WITH MACHINERY TO PRODUCE A CIRCULAR CUT WITHIN 1/32 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece. b. Type of operation. c. Finish and accuracy required. d. Kind of material.	Lecture Overhead Projector Handouts	Metal Work Technology and Practice, Ludwig, Unit #3 Hand Processes, Delmar Publishers, pp. 18-20 Teacher prepared overlays.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Interpreting teacher made blueprints. Read: Metal Work Technology and Practice, Unit #3, pp. 27-33.	Teacher prepared test on interpreting blueprints. Observing students laying out a piece of sheet metal. Completing questions at end of Unit #3.
Checking overall length of sheet metal with rule or tape. Checking gauge of sheet metal with sheet metal gauge or micrometer.	Demonstration Lecture Class Discussion	Measuring tape or rule. Sheet metal gauge. Sheet metal.	Measuring the length and gauge of sheet metal necessary for the job. Determining the size of sheet metal. necessary for cutting the required circle.	Teacher observation. Oral quiz.
Checking measurement of required circle on graduations on bed scale.	Demonstration	Ring and circle shears.		
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide.	Lecture Handouts Discussion Chalkboard	Metal Work Technology and Practice, p. 254.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Adding, subtracting, multiplying and dividing fractions and decimals. Teacher made problems.	Teacher made test on adding, subtracting, multiplying and dividing fractions and decimals.
Laying out stock with a center punch.	Demonstration	Layout Fluid Center Punch Hammer	Laying out a simple sheet metal project. Scribing lines on sheet metal. Center punching a sheet metal blank.	Visual inspection of the completed length. Observing students using center punch and hammer.
Centering blank in ring and circle shears. Cutting sheet metal with ring and circle shears to produce a circular cut within 1/32 of an inch.	Demonstration Lecture Discussion of safety features	Sheet metal. Ring and Circle Shears. Metal Work Technology and Practice, Unit 39, 256-258.	Performing an operation with the ring and circle shears.	Oral questions about the ring and circle shears. Observation of student performing cutting operations and practicing safety precautions. Read: Unit #39. Metal Work Technology and Practice. Answer questions on p. 258.
Selecting appropriate layout tool for the task.	Exhibit of layout tools Class Discussion	Hand Processes, pp. 8-12.	Identifying various layout tools in the shop. Read: Metal Work Technology and Practice, Units 5, 6, 7, and 8.	Answer questions at end of Units 5, 6, 7, and 8. Identify layout tools on a teacher prepared test.

TASK NO. 6: CUTTING SHEET METAL WITH HAND TOOLS TO PRODUCE AN IRREGULAR CUT WITHIN 1/32 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece. b. Type of operation. c. Finish and accuracy required. d. Kind of material.	Lecture Overhead Projector Handouts	Metal Work Technology and Practice, Ludwig, Unit #3. Hand Processes, Delmar Publishers, pp. 18-20. Teacher prepared overlays.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Interpreting teacher made blueprints. Read: Metal Work Technology and Practice, Unit #5, pp. 27-33.	Teacher prepared test on interpreting blueprints. Observing students laying out a piece of sheet metal. Completing questions at end of unit #3.
Checking overall length of sheet metal with rule or tape. Checking gauge of sheet metal with sheet metal gauge or micrometer.	Demonstration Lecture Class Discussion	Measuring tape or rule. Sheet Metal Gauge. Sheet Metal.	Measuring the length and gauge of sheet metal necessary for the job.	Teacher observation.
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide.	Lecture Handouts Discussion Chalkboard	Metal Work Technology and Practice, p. 254.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Adding, subtracting, multiplying, and dividing fractions and decimals. Teacher made problems.	Teacher made test on adding, subtracting, multiplying and dividing fractions and decimals.
Laying out stock with a rule or scale and scribe.	Demonstration Lecture	Scribe Rule Layout Fluid	Laying out a simple sheet metal project. Scribing lines on sheet metal.	Visual inspection of the completed layout.
Cutting sheet metal with aviation snips.	Demonstration	Aviation Snips Sheet Metal Hand Processes, p. 29.	Laying out stock, selecting the appropriate tools, and making an irregular cut using aviation snips. Observing all safety rules.	Observation of students producing irregular cut. Oral quiz, concerning safety rules.
Removing burrs from sheet metal with a file.	Demonstration	File Hand Processes, pp. 52-54.	Filing sharp edges from sheet metal.	Teacher observation and project evaluation.
Selecting appropriate layout tool for the task. Selecting the appropriate file for the task.	Exhibit of layout tools Class Discussion Lecture and Demonstration	Hand Processes, pp. 8-12.	Identifying various layout tools in the shop. Read: Metal Work Technology and Practice Units 5, 6, 7, and 8.	Answer questions at end of units 5, 6, 7, and 8. Identify layout tools on a teacher prepared test.

TASK NO. 7: CUTTING SHEET METAL WITH MACHINERY TO PRODUCE AN IRREGULAR CUT WITHIN 1/32 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece b. Type of operation c. Finish and accuracy required d. Kind of material	Lecture Overhead Projector Handouts	Metalwork Technology and Practice, Ludwig, Unit #3.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Interpreting Teacher made blueprints. Read: Metal Work Technology and Practice, Unit #3, pp. 27-33.	Teacher prepared test on interpreting blueprints. Observing students laying out a piece of sheet metal. Completing questions at end of Unit #3.
Checking overall length of sheet metal with rule or tape. Checking gauge of sheet metal with sheet metal gauge or micrometer.	Demonstration Lecture Class Discussion	Measuring tape or rule Sheet metal gauge Sheet metal	Measuring the length and gauge of sheet metal necessary for the job.	Teacher observation.
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide.	Lecture Handouts Discussion Chalkboard	Metal Work Technology and Practice, p. 254.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Adding, subtracting, multiplying, and dividing fractions and decimals. Teacher made problems.	Teacher made test on adding, subtracting, multiplying and dividing fractions and decimals.
Laying out stock with a rule or scale.	Demonstration	Scribe Rule Layout Fluid	Laying out a simple sheet metal project. Scribing lines on sheet metal.	Visual inspection of the completed layout.
Aligning sheet metal with shear blade for an accurate cut.	Demonstration Lecture Discussion of Safety Rule	Sheet Metal Nippers	Making an irregular cut using nippers, observing all safety rules.	Observation of students producing irregular cut. Oral quiz, concerning safety rules.
Removing burrs from sheet metal with a file.	Demonstration	File Hand Processes, pp. 52-54.	Filing sharp edges from sheet metal.	Teacher observation and project evaluation.
Selecting appropriate layout tool for the task. Selecting the appropriate file for the task.	Exhibit of layout tools Class Discussion Lecture Demonstration	Hand Processes, pp. 8-12.	Identifying various layout tools in the shop. Read: Metal Work Technology and Practice, Units 5, 6, 7, and 8.	Answer questions at end of units 5, 6, 7, and 8. Identify layout tools on a teacher prepared test.

TASK NO. 8: CUTTING SHEET METAL WITH HAND TOOLS TO PRODUCE A NOTCHED CUT WITHIN 1/32 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Type of operation b. Finish and accuracy required c. Kind of material	Lecture Overhead Projector Handouts	Metal Work Technology and Practice, Ludwig, Unit #3. Hand Processes, Delmar Publishers, pp. 18-20. Teacher prepared overlays	Interpreting drawing on p. 254, Metal Work Technology and Practice. Interpreting teacher made blueprints. Read: Metal Work Technology and Practice, Unit #3, pp. 27-33.	Teacher prepared test on interpreting blueprints. Observing students laying out a piece of sheet metal. Completing questions at end of unit #3.
Checking overall length of sheet metal with rule or tape. Checking gauge of sheet metal with sheet metal gauge or micrometer.	Demonstration Lecture Class Discussion	Measuring tape or rule Sheet metal gauge Sheet metal	Measuring the length and gauge of sheet metal necessary for the job.	Teacher observation.
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide.	Lecture Handouts Discussion Chalkboard	Metal Work Technology and Practice, p. 254.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Adding, subtracting, multiplying and dividing fractions and decimals. Teacher made problems.	Teacher made test on adding, subtracting, multiplying and dividing fractions and decimals.
Laying out stock with a rule or scale.	Demonstration	Scribe Rule Layout Fluid	Laying out a simple sheet metal project. Scribing lines on sheet metal.	Visual inspection of the completed layout.
Cutting sheet metal with a hand notcher to produce a notched cut within 1/32 of an inch.	Lecture Demonstration	Sheet Metal Hand Notcher Hand Processes, p. 81.	Laying out and cutting sheet metal with hand notcher.	Visual inspection of the completed job.
Removing burrs from sheet metal with a file.	Demonstration	File Hand Processes, pp. 52-54.	Filing sharp edges from sheet metal.	Teacher observation and project evaluation.
Selecting appropriate layout tool for the task. Selecting the appropriate file for the task.	Exhibit of layout tools Class Discussion Lecture & Demonstration	Hand Processes, pp. 8-12.	Identifying various layout tools in the shop. Read: Metal Work Technology and Practice, Units 5, 6, 7, and 8.	Answer questions at end of units 5, 6, 7, and 8. Identify layout tools on a teacher prepared test.

TASK NO. 9: CUTTING SHEET METAL WITH MACHINERY TO PRODUCE A NOTCHED CUT WITHIN 1/32 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece b. Type of operation c. Finish and accuracy required d. Kind of material	Lecture Overhead Projector Handouts	Metal Work Technology and Practice, Ludwig, Unit #3. Hand Processes, Delmar Publishers, pp. 18-20. Teacher prepared overlays.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Interpreting teacher made blueprints. Read: Metal Work Technology and Practice, Unit #3, pp. 27-33.	Teacher prepared test on interpreting blueprints. Observing students laying out a piece of sheet metal. Completing questions at end of unit #3.
Checking overall length of sheet metal with rule or tape. Checking gauge of sheet metal with sheet metal gauge or micrometer.	Demonstration Lecture Class Discussion	Measuring tape or rule Sheet Metal Gauge Sheet Metal	Measuring the length and gauge of sheet metal necessary for the job.	Teacher observation.
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide.	Lecture Handouts Discussion Chalkboard	Metal Work Technology and Practice, p. 254.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Adding, subtracting, multiplying, and dividing fractions and decimals. Teacher made problems.	Teacher made test on adding, subtracting, multiplying and dividing fractions and decimals.
Laying out stock with a rule or scale.	Demonstration	Scribe Rule Layout Fluid	Laying out a simple sheet metal project. Scribing lines on sheet metal.	Visual inspection of the completed layout.
Aligning sheet metal with shear blade for an accurate cut.	Demonstration Lecture	Sheet Metal Power Shears	Cutting sheet metal with a portable power shears to produce a notched cut.	Checking accuracy of cut with a rule. Comparing the completed project with the blueprint.
Cutting sheet metal with portable power shears to produce a notched cut within 1/32 of an inch.	Overhead Projector Handouts	Teacher prepared overlays		
Removing burrs from sheet metal with a file	Demonstration	File Hand Processes, pp. 52-54.	Filing sharp edges from sheet metal.	Teacher observations and project evaluation.
Selecting appropriate layout tool for the task. Selecting the appropriate file for the task.	Exhibit of layout tools Class Discussion Lecture Demonstration	Hand Processes, pp. 8-12.	Identifying various layout tools in the shop. Read: Metal Work Technology and Practice, Units 5, 6, 7, and 8.	Answer questions at end of units, 5, 6, 7, and 8. Identify layout tools on a teacher prepared test.

TASK NO. 10: CUTTING SHEET METAL TO PRODUCE AN INTERIOR CUT WITHIN 1/32 OF AN INCH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece b. Type of operation c. Finish and accuracy required d. Kind of material	Lecture Overhead Projector Handouts	Metal Work Technology and Practice, Ludwig, Unit #3. Hand Processes, Delmar Publishers, pp. 18-20. Teacher prepared overlays	Interpreting drawing on p. 254, Metal Work Technology and Practice. Interpreting teacher made blueprints. Read: Metal Work Technology and Practice, Unit #3, pp. 27-33.	Teacher prepared test on interpreting blueprints Observing students laying out a piece of sheet metal. Completing questions at end of unit #3.
Checking overall length of sheet metal with rule or tape. Checking gauge of sheet metal with sheet metal gauge or micrometer.	Demonstration Lecture Class Discussion	Measuring tape or rule Sheet Metal Gauge Sheet Metal	Measuring the length and gauge of sheet metal necessary for the job.	Teacher observation.
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide.	Lecture Handouts Discussion Chalkboard	Metal Work Technology and Practice, p. 254.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Adding, subtracting, multiplying and dividing fractions and decimals. Teacher made problems.	Teacher made test on adding, subtracting, multiplying and dividing fractions and decimals.
Laying out stock with a rule or scale.	Demonstration	Scribe Rule Layout Fluid	Laying out a simple sheet metal project. Scribing lines on sheet metal.	Visual inspection of the completed layout.
Aligning sheet metal with shear blade for an accurate cut. Cutting sheet metal with aviation snips to produce an interior cut within 1/32 of an inch. Cutting sheet metal with a portable power shear to produce an interior cut within 1/32 of an inch.	Demonstration Lecture	Sheet Metal Layout Fluid Aviation Snips Power Shears	Laying out, cutting, and deburring sheet metal with hand snips and power shears.	Visual Inspection Final test which will include information from all cutting tasks learned previously.
Removing burrs from sheet metal with a file.	Demonstration	File Hand Processes, pp. 52-54.	Filing sharp edges from sheet metal.	Teacher observation and project evaluation.
Selecting appropriate layout tool for the task. Selecting the appropriate file for the task.	Exhibit of layout tools Class Discussion Lecture Demonstration	Hand Processes, pp. 8-12.	Identifying various layout tools in the shop. Read: Metal Work Technology and Practice, Units 5, 6, 7, and 8.	Answer questions at end of units 5, 6, 7, and 8. Identify layout tools on a teacher prepared test.

TASK NO. 11: FORMING SHEET METAL CYLINDERICAL SHAPES ON SLIP ROLL FORMING MACHINE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Adjusting bottom roll for receiving specific gauge. Adjusting back roller for forming cylinder. Operating slip forming machine to produce a cylinder. Readjusting back roller for small cylinder shape. Removing cylinderical shape from slip roll forming machine.	Lecture Demonstration	Sheet Metal Slip Forming roll	Participating in rolling or forming metal into cylinderical shapes. Read: Unit #40, Metal Work Technology and Practice.	Visual inspection as students perform operation with scrap metal. Answer questions on p. 264, Metal Work Technology and Practice.

TASK NO. 12: FORMING SHEET CRIMPING ON A CRIMPING MACHINE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Measuring with rule to set gauge on crimping machine.	Lecture Demonstration	Rule Crimping Machine	Setting gauge on crimping machine to a specified depth.	Visual inspection.
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide.	Lecture Handouts Discussion Chalkboard	Metal Work Technology and Practice, p. 254.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Adding, subtracting, multiplying, and dividing fractions and decimals. Teacher made problems.	Teacher made test on adding, subtracting, multiplying and dividing fractions and decimals.
Installing crimping rolls on crimping machine. Adjusting gauge on crimping machine to produce a specific length crimp. Operating crimping machine to produce a crimped edge. Adjusting crankscrew for specific depth of crimp. Holding work in a horizontal position against gauge.	Demonstration Procedural Plan Sheet	Sheet Metal Crimping Machine	Read: Unit #40, Metal Work Technology and Practice. Operating crimping machine. Installing crimping rolls.	Answer questions on p. 264, Metal Work and Technology and Practice. Visual Inspection. Oral Quiz. Evaluation of required exercises.
Operating crimping machine without running over seam.	Demonstration	Crimping Machine	Operating crimping machine taking care not to run over the seam.	Visual inspection of the completed job.

TASK NO. 13: FORMING SHEET METAL BEADING ON A BEADING MACHINE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Measuring with a rule to set gauge on beading machine.	Lecture Demonstration	Rule Beading Machine	Setting gauge on crimping machine to a specific depth.	Visual inspection.
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide.	Lecture Handouts Discussion Chalkboard	Metal Work Technology and Practice, p. 254.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Adding, subtracting, multiplying, and dividing fractions and decimals. Teacher made problems.	Teacher made test on adding, subtracting, multiplying and dividing fractions and decimals.
Installing beading rolls on beading machine. Checking alignment of the rolls for equal side clearance. Adjusting gauge on beading machine to set distance for bead. Holding work against gauge for uniform bead. Operating beading machine to produce a bead.	Lecture Demonstration Overhead Projector	Sheet Metal Beading Machine Teacher Prepared Overlays	Observing demonstration. Participating in checking, installing, beading rolls, holding work, and operating beading roll.	Questioning students on aspects of beading machine.
Selecting proper beading rolls for the task. Operating beading machine without running over seam.	Demonstration	Beading Machine Beading Rolls	Choosing beading rolls and operating beading machine.	Visual inspection of completed job.

TASK NO. 14: FORMING A SINGLE HEM ON BAR FOLDER OR BRAKE FOR STRENGTH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading scale adjustment on bar folder for depth of bend.	Overhead Projector. Presentation. Handouts on "Reading a Rule"	Teacher prepared overlays on "How to Read a Rule" Bar Folder	Written exercise on "How to Read a Rule."	Teacher prepared quiz on "How to Read a Rule."
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide.	Lecture Handouts Discussion Chalkboard	Metal Work Technology and Practice, p. 254.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Adding, subtracting, multiplying, and dividing fractions and decimals. Teacher made problems.	Teacher made test on adding, subtracting, multiplying and dividing fractions and decimals.
Adjusting depth gauge on bar folder for specific size hem. Operating bar folder to produce a hem. Aligning layout line with bending leaf. Operating a brake to produce a hem. Setting down hem on bar folder. Setting down hem on a brake.	Demonstration Overhead Projector	Sheet Metal Bar Folder or Brake Teacher made overlays Machine Processes, Delmar Publishers, Sheet Metal Series, pp. 1-18.	Operating brake and bar folder to bend single hem to specific size. Drawing a diagram of a single hem. Outlining the steps involved in producing a single hem using a brake or bar folder. Read: Machine Processes, Delmar Publications, Sheet Metal Series, pp. 1-18.	Check exercise that is required of students. Evaluating diagrams and outlines. Teacher prepared quiz on material in Machine Processes.
Allowing enough material for bend.	Discussion	Sheet Metal	Practice on scrap to perform bend allowing for bend radius.	Visual inspection of practice pieces.

TASK NO. 15: FORMING DOUBLE HEM ON BAR FOLDER OR BRAKE FOR STRENGTH

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading scale adjustment on bar folder for depth of bend.	Overhead Projector Presentation Handouts on "Reading a Rule."	Teacher prepared Overlays on "How to Read a Rule" Bar Folder	Written exercise on "How to Read a Rule."	Teacher prepared quiz on "How to Read A Rule."
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide.	Lecture Handouts Discussion Chalkboard	Metal Work Technology and Practice, p. 254.	Interpreting drawing on p. 254, Metal Work Technology and Practice. Adding, subtracting, multiplying, and dividing fractions and decimals. Teacher made problems.	Teacher made test on adding, subtracting, multiplying and dividing fractions and decimals.
Operating bar folder to produce a double hem. Operating brake to produce a double hem. Readjusting depth gage on bar folder for specific size double hem.	Demonstration	Sheet Metal Bar Folder or Brake	Operation of bar folder to produce double hem of a specific size. Drawing a diagram of a single hem. Outlining the steps involved in producing a double hem using a brake or bar folder. Read: Machine Processes, pp. 1-18.	Check exercise that is required of students. Evaluation of diagrams and outlines. Teacher prepared quiz on material in machine processes.
Allowing enough material for bend.	Discussion	Sheet Metal	Practice on scrap to perform bend allowing for hem radius.	Visual inspection of practice pieces.

TASK NO. 16: FORMING SINGLE SEAM ON A BRAKE OR BAR FOLDER FOR JOINING SHEET METAL PARTS

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading scale adjustments on bar folder for depth of bend.	Overhead Projector Presentation Handouts on "Reading a Rule"	Teacher Prepared Overlays on "How to Read a Rule" Bar Folder	Written exercise on "How to Read a Rule"	Teacher prepared quiz on "How to Read a Rule"
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide.	Lecture Handouts Discussion Chalkboard	Metal Work Technology and Practice, p. 234.	Interpreting drawing on p. 234, Metal Work Technology and Practice. Adding, subtracting, multiplying, and dividing fractions and decimals. Teacher made problems.	Teacher made test on adding, subtracting, multiplying and dividing fractions and decimals.
Operating a bar folder to produce a single seam. Aligning layout line with bending leaf. Operating a brake to produce a single seam.	Demonstration Overhead Projector	Sheet Metal Brake or bar folder Teacher Prepared Overlays	Operating brake and/or bar folder to produce a single seam. Drawing a diagram of a single seam. Outlining the steps involved in producing a single seam using a brake or bar folder.	Observation and checking exercise. Evaluation of diagrams and outlines.

TASK NO. 17: FORMING DOUBLE SEAM ON A BRAKE OR BAR FOLDER FOR JOINING SHEET METAL PARTS

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading scale adjustment on bar folder for depth of bend.	Overhead Projector Presentation Handouts on "Reading a Rule"	Teacher prepared overlays on "How to Read a Rule" Bar Folder	Written exercise on "How to Read a Rule"	Teacher prepared quiz on "How to Read a Rule"
Applying knowledge of fractional parts of an inch to multiply, add, subtract and divide.	Lecture Handouts Discussion Chalkboard	Metal Work Technology and Practice, p. 204.	Interpreting drawing on p. 204, Metal Work Technology and Practice. Adding, subtracting, multiplying, and dividing fractions and decimals. Teacher Made problems.	Teacher made test on adding, subtracting, multiplying and dividing fractions and decimals.
Operating bar folder to produce a double seam. Operating a brake to produce a double seam.	Demonstration	Sheet Metal Brake or Bar Folder	Read: Metal Work Technology and Practice, Unit #40. Diagram a double seam. Outline the steps involved in producing a double seam. Operating a brake or bar folder to produce a double seam of a specific size.	Evaluate answers to questions at end of unit #40, p. 264. Evaluate outlines and diagrams. Evaluate the practice exercise.

TASK NO. 18: FORMING THE PITTSBURG LOCK SEAM WITH MACHINERY FOR JOINING SHEET METAL PARTS

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Determining overall dimensions of piece to be formed by adding material to form lock plus width of piece.	Lecture Overhead Projector Demonstration	Teacher Prepared Overlays Rule Sheet Metal	Calculating the amount of material needed to form a pittsburg lock seam of a specified size.	Teacher prepared quiz. Calculate the amount of material needed to produce a pittsburg lock seam of specified sizes.
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide.	Lecture Handouts Discussion Chalkboard	Metal Work Technology and Practice, p. 254.	Teacher made problems. Adding and subtracting fractions.	Teacher made quiz on adding and subtracting fractions.
Adjusting machine to gauge metal to be fed. Operating a brake to form a pittsburg lock seam.	Demonstration	Sheet Metal Brake	Measuring, adjusting, and operating the brake to form a pittsburg lock. Read: Machine Processes, pp. 16-20. Outline the steps involved in forming a pittsburg lock seam. Diagram a pittsburg lock seam.	Check exercise Answer teacher prepared questions on reading assignment. Evaluate outlines and diagrams.

TASK NO. 19: FORMING CAP STRIP SEAM ON A DRIVE CAP MACHINE FOR JOINING SHEET METAL PARTS

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide.	**Lecture Handouts Discussion Chalkboard**	**Metal Work Technology and Practice, p. 234.**	**Teacher made problems. Adding and subtracting fractions.**	**Teacher made quiz on adding and subtracting fractions.**
Adjusting machine for gauge metal to be fed. Operating drive cap forming machine. Cutting sheet metal to specific dimensions for feeding drive cap machine.	**Demonstration Overhead Projector**	**Sheet Metal Drive Cap Machine Teacher Made Overlays**	**Adjusting and operating drive cap machine to produce exercise to be turned in.**	**Observing and checking exercise.**

TASK NO. 20: DRILLING SHEET METAL TO PRODUCE A FASTENER RECEIVER HOLE

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece b. Type of operation c. Finish and accuracy required d. Kind of material	Lecture Overhead Projector Handouts	Metal Work Technology and Practice, Ludwig. Hand Processes, Delmar Publishers, pp. 19-20. Teacher Prepared Overlays.	Interpreting drawing on p. 254, Ludwig, Metal Work Technology and Practice. Interpreting Teacher made blueprints. Reading: Metal Work Technology and Practice, Unit #3, pp. 27-33.	Test on interpreting blueprints - teacher made. Observing students layout a piece of sheet metal. Completing questions at end of unit #3.
Applying knowledge of fractional parts of an inch to multiply, add, subtract, and divide.	Lecture Handouts Discussion Chalkboard	Ludwig, Metal Work Technology and Practice, Third edition, pp. 254, McKnight and McKnight Publishers	Teacher made problems. Adding and subtracting fractions.	Teacher made quiz on adding and subtracting fractions.
Laying out sheet metal.	Demonstration	Scribe Bluing	Laying out a simple sheet metal project. Scribing lines on sheet metal.	Visual inspection of completed job.
Punching sheet metal with a center punch for accurate drilling. Installing drill in drill chuck. Clamping sheet metal to drill press table. Operating hand drill to produce a hole. Removing burrs with an old drill.	Demonstration Lecture Overhead Projector	Sheet Metal Drill Press Drills Teacher Prepared Overlays	Reading blueprints, laying out stock, center punching stock, inserting drill, and drilling hole in sheet metal. Read: Metal Work Technology and Practice, Units 27, 28, and 29. Answer questions at end of Units 28 and 29.	Checking work in progress. Evaluate answers to question at end of units 28 and 29.
Selecting correct size drill for task to be performed.	Lecture	Drill Chart	Selecting drill from index. Read: Unit 25, Metal Work Technology and Practice.	Visual inspection. Evaluate answers to questions at end of Unit 25, pp. 167-168.

TASK NO. 21: WELDING (SPOT) SHEET METAL PARTS TO PRODUCE AN ASSEMBLY

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprints to determine number and spacing of spot welds.	Lecture Overhead Projector Handouts	Metal Work Technology and Practice, Ludwig. Hand Processes, Delmar Publishers, pp. 18-20. Teacher Prepared Overlays	Interpreting drawing on p. 254, Ludwig, Metal Work Technology and Practice. Interpreting teacher made blueprints. Reading: Metal Work Technology and Practice, Unit #3, pp. 27-33.	Test on interpreting blueprints. Teacher made. Observing students layout a piece of sheet metal. Completing questions at end of unit #3.
Measuring with scale and marking pencil spots to be welded.	Demonstration Overhead Projector Presentation Handouts on "Reading a Rule"	Scale Pencil Stock Teacher prepared overlays on "How to Read a Rule"	Written exercise on "How To Read A Rule"	Teacher prepared quiz on "How To Read A Rule"
Applying knowledge of decimals.	Lecture Handouts Discussion	Ludwig, Metal Working Technology and Practice, Third Edition, pp. 254, McKnight and McKnight, Publishers.	Teacher made problems. Adding and subtracting fractions.	Teacher made quiz on adding and subtracting fractions.
Cleaning sheet metal to be spot welded. Adjusting spot welder for correct weld time and pressure. Clamping metal assembly for spot welding. Aligning tips of spot welder with area to be welded. Removing clamping devices from welded assembly.	Demonstration Overhead Projector	Sheet Metal Smith, Robert E. Forging and Welding (Bloomington, McKnight and McKnight) 1956, Unit #73.	Cleaning metal, adjusting spotwelder, clamping, and spot welding sheet metal. Read: Forging and Welding, Unit 73.	Testing joint by pressure. Teacher made quiz on spot welding.

TASK NO. 22: SOLDERING SHEET METAL PARTS TO PRODUCE AN ASSEMBLY

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprints to determine: a. Number of parts to be soldered b. Surfaces to be soldered	Lecture Overhead Projector Handouts	Metal Work Technology and Practice, Ludwig.	Interpreting drawing on p. 234, Ludwig, Metal Work Technology and Practice. Interpreting teacher made blueprints. Reading: Metal Work Technology and Practice, Unit #3, pp. 27-33.	Test on interpreting blueprints. Teacher made. Observing students layout a piece of sheet metal. Completing questions at end of Unit #3.
Cleaning surfaces to be soldered. Clamping work to be soldered. Tinning the soldering copper for efficient soldering. Applying flux to the metal to be soldered. Soldering sheet metal for assembly. Testing soldered joint with water for leaks.	Demonstration Lecture	Steel Wool Clamp Solder Flux Sheet Metal Soldering Iron	Reading information sheet observation of overhead projection. Cleaning, clamping, tinning, and soldering a sheet metal joint.	Testing exercise turned in.
Selecting most appropriate method of soldering for the task. Selecting method of applying solder to specific joint. Selecting appropriate solder for the job. Selecting correct flux for the solder. Selecting most appropriate tinning solutions. Selecting appropriate method of holding work to be soldered. Handling acids with care for safety.	Demonstration Discussion	Teacher Prepared Information Sheet	Identifying types of fluxes, solders, and soldering iron to be used in different situations. Read: Metal Work Technology and Practice, Unit #42. Answer questions at end of Unit #42.	Class Observation Discussion Check answers to questions at end of unit.

TASK NO. 23: FASTENING SHEET METAL PARTS WITH SHEET METAL SCREWS TO PRODUCE AN ASSEMBLY

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprints to determine size and number of sheet metal screws needed for the job.	Lecture Demonstration	Blueprints Assortment of Screws	Interpreting drawing on p. 254, Ludwig, Metal Work Technology and Practice. Interpreting Teacher made blueprints. Reading: Metal Work Technology and Practice, Unit #3, pp. 27-33.	Test on interpreting blueprints. Teacher made. Observing students layout a piece of sheet metal. Completing questions at end of Unit #3.
Drilling correct size hole to accommodate screws to be used. Punched sheet metal with center punch to start drill. Fastening sheet metal parts with sheet metal screws.	Demonstration	Drill Bit Sheet Metal Sheet Metal Screw Screw Driver Center Punch Drill	Selecting, drilling and inserting sheet metal screws into metal. Fastening sheet metal parts together with screws.	Visual inspection.
Selecting correct sheet metal screws for type and thickness of metal to be assembled. Selecting correct tightening tool for screws to be used.	Class Discussion	Charts showing assorted types of bolts and screws	Read: Metal Work Technology and Practice, Unit #37. Answer questions at end of unit.	Evaluate answers to questions at end of the unit.

TASK NO. 24: BOLTING SHEET METAL PARTS TO PRODUCE AN ASSEMBLY

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprints to determine: a. Parts to be bolted b. Size of bolts required c. Type fit required d. Torque required	Lecture Demonstration	Blueprints Bolt Charts Assorted Bolts Torque Charts	Interpreting drawing on p. 254, Ludwig, Metal Work Technology and Practice. Interpreting teacher made blueprints. Reading: Metal Work Technology and Practice, Unit #3, pp. 27-33.	Test on interpreting blueprints. Teacher Made. Observing students layout a piece of sheet metal. Completing questions at end of Unit #3.
Fastening sheet metal parts with bolts.	Demonstration	Bolts Sheet Metal	Fastening sheet metal parts together with bolts.	Visual inspection of students performing the task.
Selecting correct bolts for type and thickness of metal to be assembled. Selecting correct tightening tool for bolts to be used. Selecting correct washer to be used for assembly.	Discussing	Charts showing assorted types of bolts and screws	Read: Metal Work Technology and Practice, Unit #37. Answering questions at the end of Unit 37.	Evaluate the answers to questions at the end of the unit.

TASK NO. 25: RIVETING SHEET METAL PARTS TO PRODUCE AN ASSEMBLY

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprints to determine: a. Parts to be riveted b. Size of rivets c. Tip fit required d. Style head to be formed	Lecture Overhead Projector Handouts	Metal Work Technology and Practice, Ludwig. Hand Processes, Delmar Publishers, pp. 18-20. Teacher Prepared Overlays	Interpreting drawing on p. 254, Ludwig, Metal Work Technology and Practice. Interpreting Teacher made blueprints. Reading: Metal Work Technology and Practice, Unit #3, pp. 27-33.	Test on interpreting blueprints. Teacher made. Observing students layout a piece of sheet metal. Completing questions at end of Unit #3.
Drilling correct size hole to accommodate rivets to be used. Riveting sheet metal parts for assembly.	Demonstration	Rivet Set Hammer Drill Bit Rivet Drill	Read: Metal Work Technology and Practice, Unit #36. An Answer questions at end of Unit. Drilling, setting and flattening rivets for exercise to be turned in.	Evaluate answers to questions at end of unit. Checking exercise
Selecting correct riveting tools for the job a. Hand b. Power Selecting correct rivets to be used for type and thickness of metal to be assembled.	Discussing	Rivet Set Hand Set Power Set	Selecting the proper drill size for the specified rivet. Determining the proper size rivet for the job to be done.	Teacher made problems. Determining the proper size rivet to be used for various type jobs.

TASK NO. 26: JOINING SHEET METAL PARTS WITH SEAMS

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprints to determine specific seam(s) to be used in the assembly and their relationship	Lecture Demonstration	Blueprints Ludwig, Metal Working Technology and Practice, p. 254.	Interpreting drawing on p. 254, Ludwig, Metal Work Technology and Practice.	Test on interpreting blueprints. Teacher made. Observing students layout a piece of sheet metal. Completing questions at end of Unit #3.
Assembling sheet metal parts with seams Locking sheet metal seams for permanent assembly. Selecting parts to be mated by seams.	Demonstration Lecture Demonstration	Brake Mallet Hand Seamer Handout	Assembling sheet metal parts with seams using mallet, brake and hand seamer. Exercise to be turned in.	Checking exercise. Written test covering all assembly tasks.
Selecting parts to be mated by seams.	Lecture Demonstration	Handout	Assembling sheet metal parts with seams using mallet, brake, and hand seamer. Exercise to be turned in.	Checking exercise. Written test covering all assembly tasks.

OCCUPATIONAL INFORMATION FOR SHEET METAL WORK

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
The employment outlook: 1. Local 2. National	Presentation by local officer. Overhead projector presentation.	Teacher-prepared chart showing local statistics. Teacher-prepared transparencies from Employment Outlook for Sheet-Metal Workers and Roofers, Bureau of Labor Statistics, Bulletin #1450-75, Government Printing Office, Washington, D.C., pp. 5-6.	Listening to presentation and discussing possible employment opportunities. Participating in teacher-conducted presentation of the national situation.	Write a paragraph justifying the sheet metal trade as a vocational choice. Write a paragraph comparing the sheet-metal trade on a local and national level.
The wage scale: 1. Local a. union (1) apprentice (2) journeyman (3) master b. non-union (1) entry wages (2) experienced 2. National a. union (1) apprentice (2) journeyman (3) master b. non-union (1) entry wages (2) experienced	Lecture. Presentation by local union steward. Class conducted survey. Reading assignment.	Teacher-prepared chart showing wages at different levels. Survey acquired information. Publication: Employment Outlook for Sheet-Metal Workers and Roofers, Bureau of Labor Statistics, Bulletin #1450-75, Government Printing Office, Washington, D.C. pp. 5-6.	Attend lecture and participate in class discussion. Conduct survey of local union and non-union wages. Reading and discussing Department of Labor Materials.	Short quiz - one day after presentation. Oral presentation on result of survey. Class discussion of local and national rates.
The types of training available: 1. Apprenticeship programs 2. Technical or trade schools 3. On-the-job 4. Military	Tape recordings of presentations by: a. local employers b. local vocational-technical representatives c. local employers d. local recruiters	Tape recording of presentations by various individuals. Tape recorder.	Attend presentations by: Local employers. Local vocational-technical representatives. Local recruiters.	The student will write a short paper on which type of training is most suitable for him, considering local situation and family resources.
The working conditions experienced in the occupation.	Lecture. Presentation by local journeyman.	Publication: Employment Outlook for Sheet-Metal Workers and Roofers, Bureau of Labor Statistics, Bulletin #1450-75, Government Printing Office, Washington, D.C., p. 9. Sheet Metal Worker, Occupational Guide #55, Michigan Employment Security Commission, 7310 Woodward Avenue, Detroit, Michigan 48202.	Participate in class discussion based on the lecture. Visit various local industries - interview sheet-metal worker, take 35mm slides of working conditions. Read: Job Guide for Young Workers, 1963-64 edition, Government Printing Office, Washington, D.C., p. 64.	Write a short paragraph describing working conditions in the sheet-metal occupations. Oral report of visit - show 35mm slides. Write a brief report on reading assignment.

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OCCUPATIONAL INFORMATION UNIT FOR SHEET METAL WORK (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
The physical and mental characteristics needed for qualification for employment.	Reading assignment.	Publication: Employment Outlook for Sheet-Metal Workers and Roofers, Bureau of Labor Statistics, Bulletin #1450-75, Government Printing Office, Washington, D.C. Sheet-Metal Worker, Occupational Guide #55, Michigan Employment Security Commission, 7310 Woodward Avenue, Detroit, Michigan 48202.	Reading and discussing indicated reference.	Teacher-conducted oral discussion of personal qualifications necessary for employment.
The geographical location of employment.	Lecture.	Map of U.S.A. Guide to Chamber of Commerce Offices in the U.S.	Listening to lecture. Assignment: Writing to various Chamber of Commerce Offices of large cities to obtain employment figures. Place information on maps.	Check results of assignment. Fill in prepared U.S. map, indicating areas of relative density of employment.
The opportunities for advancement.	Lecture.	Publication: Employment Outlook for Sheet-Metal Workers and Roofers, Bureau of Labor Statistics, Bulletin #1450-75, Government Printing Office, Washington, D.C.	Listen to lecture. Read: Job Guide for Young Workers, 1963-64 edition, Government Printing Office, Washington, D.C., p. 64.	Oral questions based on lecture and reading assignment.
The advantages and disadvantages of the occupation.	Lecture. Student survey.	Teacher-prepared chart comparing advantages and disadvantages. Publication: Sheet-Metal Worker, Occupational Guide #55, Michigan Employment Security Commission, 7310 Woodward Avenue, Detroit, Michigan, 48202.	Attend lecture and participate in discussion.	Oral discussion. Develop a list of advantages and disadvantages.
Nature of the work involved in the occupation.	Reading assignment.	Publication: Employment Outlook for Sheet-Metal Workers and Roofers, Bureau of Labor Statistics, Bulletin #1450-75, Government Printing Office, Washington, D.C.	Read: Employment Outlook for Sheet-Metal Workers and Roofers, pp. 7 & 8.	Written quiz on job description.
The union involvement in the occupation.	Lecture by local union steward.	Tape recording of presentation by union steward.	Attend lecture and participate in discussion.	Write up personal reactions to the trade union relationship.

WELDING

TASK NO. 1: ARC WELDING FERROUS METAL WITH A.C. WELDER TO PRODUCE A FLAT BUTT JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine: 1. Size and characteristic of workpiece. 2. Type of weld required. 3. Finish and accuracy required. 4. Number of items to be welded. 5. Kind of material Reading equipment manual to determine equipment set up.	Lecture Demonstration	Sample Blueprints Equipment Manual. Text: Bennet and Sly, Blueprint Reading for Welders, Albany, New York, Delmar Publishers, unit No. 1.	Listen to lecture Read Assignment in Text: Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y.	Quiz from page 5 of Bennet and Sly
Measuring stock with a rule to determine length. Checking fit up with a rule and square to obtain an accurate assembly. Checking work with fillet gauges.	Demonstration Filmstrip	Tools: Steel Rule Square Fillet Gauges Rough Stock Filmstrip: "Laying Out," Society for Visual Education, 1345 Diversey Parkway, Chicago. Text: Ludwig, Metal Work Technology and Practice, McKnight and McKnight Publishing Company, Bloomington, Illinois.	Observing demonstration and filmstrip. Reading assignment in Ludwig. Writing answer to questions in Ludwig, pp. 51, 57, 65, and 71.	Teacher-group discussion of assignment. Written quiz on filmstrip.
Applying knowledge of fractional parts of an inch. 1. Multiplying fractions to determine exact dimensions. 2. Adding fractions to determine exact dimensions. 3. Dividing fractions to determine exact dimensions.	Pretest with remedial assignment if needed. Overhead Projector Lesson	1. Teacher prepared test on fractions. 2. Teacher prepared assignment on fractional problems. 3. Overhead projector, Math Program #18, from V.P. Division of 3M Company.	Solve problems on pretest. Complete additional assignment if required. Observe overhead projector program.	Score pretest Readminister pretest after remedial work is completed.
Selecting appropriate layout tools for the task. Selecting appropriate hacksaw blades for the task. Selecting appropriate grinder for the task. Selecting correct type of electrode for size and type of metal to be welded. Selecting proper heat for type and thickness of metal being welded.	Demonstration Film	Tools: Square Steel Rule Scriber (Talc) 1/4" Plate Hacksaw Blades Grinder Goggles Assorted Electrodes Films: "Hacksaws," Proto Tools, 2209, Sante Fe Ave., Los Angeles, Cal. "The Grinding Wheel," Norton Abrasive Co. Text: Giachino, Weeks and Brune, Welding Skills and Practice, American Technical Society, Chicago, pp. 40-47.	Observe demonstration and films. Read Ludwig, Metal Work Technology and Practice, McKnight and McKnight, Bloomington, Ill., Units 5, 6, 7,8, 11, and 12.	Written quiz on assigned reading and on film.

Task No. I (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Positioning work to be welded in most advantageous position for gravitational effects on appearance of bead. Applying different electrode angles in relation to type and thickness of metal being welded. Identifying flux for removal with chipping hammer. Selecting proper type of file. Selecting abrasive cloth for removing burrs. Practicing proper safety precautions when using electric welding equipment. 1. Wearing goggles or face shield. 2. Wearing appropriate apparel 3. Maintaining equipment regularly 4. Shielding welding area.	Lecture Demonstration Film Practical Work	Tools: Files Abrasive Cloth Chipping Hammer Welding Rig Electrodes Shield Text: Giachino, Weeks, and Brune, Welding Skills and Practice, American Technical Society, Chicago, Ill, Chapters 7 & 8. Film: "Inside of Arc Welding," (Reel #1), General Electric Co., 1405 Locust Street, Phil. 2, Pa.	Observe demonstration and film. Practice safe welding techniques using proper electrodes.	Written quiz on film. Observe students at work.
Laying out stock with a: 1. Square 2. Rule or Scale 3. Combination Square 4. Center Head 5. Hemaphrodite Calipers 6. Surface Gauge 7. Dividers 8. Trammel Points 9. Scriber 10. Center Punch Cutting metal to dimensions with: 1. Hand Hack Saw 2. Power Hack Saw 3. Power Band Saw 4. Gas Cutting Torch Grinding stock to specific dimensions. Grinding a bevel on heavy plate for adequate penetration. Cleaning metal parts to be welded to obtain weld with necessary strength.	Lecture Demonstration	Tools: Tools and equipment as indicated in Column I. Grinder Blueprints Stock to be layed out Goggles Gloves	Observe demonstration. Practice laying out stock from blueprints.	Observe and check visually.

Task No. 1 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Connecting electrical components on welder according to manual specifications. Clamping work to obtain fit up. Grounding work to obtain adequate conductance. Tacking fit up assembly to minimize warpage and buckling. Preheating weld area to bring metal to proper welding temperature. Strinking an arc to join metals together. Running a bead on weld joint according to specifications. Stopping and re-starting a bead for specific weld dimensions. Cleaning weld with chipping hammer and wire brush for additional welding or finished weld. Removing burrs from finished work with: 1. File 2. Abrasive Cloth	Demonstration Practical Work	Tools: Clamps Files Abrasive Cloth Chipping Hammer Welding Rig Electrodes Shield Gloves Welding Equipment Manual Rough Stock to Weld Text: Giachino, Weeks and Brune, _Welding, Skills and Practice_, American Technical Society, Chicago, Illinois.	Observe demonstration. Read assignment in text. Practice connecting welder, welding, and cleaning weld.	Quiz on reading assignment. Observe students welding.
Explaining the physical properties of the fusibility of various metals. Explaining the electron theory of current flow in welding.	Reading Assignment Film Class Discussion	Text: Rossi, Boniface E., _Welding and Its Application_, McGraw-Hill, N.Y., pp. 169-198. Film: "The Principles of Electricity," General Electric Co.	Read assignment in text. View Film. Discuss assignment and film in class.	Written test on assignment.

TASK NO. 2: ARC WELDING FERROUS METALS WITH A.C. WELDER TO PRODUCE A FLAT LAP JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Reading. Discussing.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., pp. 6-9.	Reading assignment. Observing blueprint. Discussing above.	Written exercises, Bennet and Sly, p. 9.

TASK NO. 3: ARC WELDING FERROUS METALS WITH A.C. WELDER TO PRODUCE A FLAT INSIDE CORNER JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Reading equipment manual to determine equipment set up.	Reading text. Observing blueprint. Discussing above.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., unit no. 3, pp. 10-13.	Reading text. Observing blueprint.	Completing unit quiz.
Measuring stock with a rule or scale to determine length. Checking fit-up with a rule and square to obtain an accurate assembly. Checking work with fillet gages.	Reading assignment. Filmstrip. Teacher-student joint inspection.	Ludwig, Metalwork Technology and Practice, McKnight & McKnight Publishing Company, Bloomington, Illinois, pp. 47-74. Filmstrip: "Laying Out," Society for Visual Education, 1345 Diversey Parkway, Chicago, Illinois. Althouse, Turnquist and Bowditch, Modern Welding, Goodheart-Willcox Publishing Co., Homewood, Illinois.	Responding to sources suggested column No. 3. Writing answers to questions, Ludwig, pp. 51, 57, 65, and 71.	Instructor observation and checking Teacher-group discussion of answers to questions assigned in Column #3.
Applying knowledge of fractional parts of an inch: a. Multiplying fractions to determine exact dimensions. b. Adding fractions to determine exact dimensions. c. Dividing fractions to determine exact dimensions.	Remedial, only as needed	Audio notebook program.	Listening and responding to sources suggested column No. 3. Executing requirements for task.	Instructor check accuracy of completed task.

Task No. 3 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting appropriate layout tools for the task. Selecting appropriate hacksaw blades for the task. Selecting appropriate grinder for the task. Selecting correct type of electrode for size and type of metal to be welded. Selecting proper heat for type and thickness of metal being welded. Note: See Task No. 1 for remaining information.	Programed Instruction.	Vocational packet #3 - "Arc Welding," transparencies, 3M Company, Visual Products Division, Bldg. 220-10E, 2501 Hudson Road, St. Paul, Minn. 55119.	Viewing materials. Discussing illustrated techniques.	Test on materials covered on transparencies.

TASK NO. 4: ARC WELDING FERROUS METALS WITH A.C. WELDER TO PRODUCE A HORIZONTAL OUTSIDE CORNER JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Reading assignment.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., unit no. 4, pp. 14-25.	Reading text. Observing blueprint. Discussing above.	Completing written exercises, Bennet and Sly, p. 25.

TASK NO. 5: ARC WELDING FERROUS METALS WITH A.C. WELDER TO PRODUCE A HORIZONTAL TEE JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Testing.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., p. 27 -"Achievement Test."	Studying test questions.	Answering test questions. Checking test answers in groups, looking up correct answers for those missed.

TASK NO. 6: ARC WELDING FERROUS METALS WITH A.C. WELDER TO PRODUCE A VERTICAL LAP JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Blueprint study.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., unit 5A, pp. 28-36. Giachino, Weeks and Brune, Welding, Skills, and Practice, American Technical Society, Chicago, Illinois, Chapter 9.	Reading assignment. Studying blueprint.	Completing written assignment, Bennet and Sly, p. 36.

TASK NO. 7: ARC WELDING PIPE STOCK WITH A.C. WELDER TO PRODUCE BUTT JOINTS WHILE FIXED

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Blueprint study.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., unit 15, pp. 106-110. Giachino, Weeks and Brune, Welding, Skills, and Practice, American Technical Society, Chicago, Illinois, Chapter 17.	Observing illustrations, pp. 106-107. Reading accompanying text, pp. 106-107. Completing written work, pp. 108-111.	Group checking written work.

TASK NO. 8: ARC WELDING PIPE STOCK WITH A.C. WELDER TO PRODUCE BUTT JOINTS WHILE ROLLING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Blueprint study.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., unit 16, pp. 111-113. Kerwin, Harry, Arc and Acetylene Welding, McGraw-Hill, 1944, pp. 196-207.	Reading text - study illustrations, p. 111. Completing written exercises, pp. 112-113.	Group checking written work.

TASK NO. 9: ARC WELDING FERROUS METALS WITH D.C. WELDER TO PRODUCE A FLAT BUTT JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Blueprint study.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., unit 5B, pp. 38-39. Althouse, Turnquist, and Bowditch, Modern Welding, Goodheart-Willcox Publishing Co., Inc., Chapters 5 and 6. Welding rig and Equipment manual.	Observing and studying blueprint.	Completing written exercises, Bennet and Sly, p. 39.

TASK NO. 10: ARC WELDING FERROUS METALS WITH D.C. WELDER TO PRODUCE A FLAT LAP JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Blueprint study.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., unit 5C, pp. 40-41. Althouse, Turnquist, and Bowditch, Modern Welding, Goodheart-Willcox Publishing Co., Inc., Chapters 5 and 6.	Studying blueprint, p. 40.	Completing blueprint quiz, Bennet and Sly, p. 41.

TASK NO. 11: ARC WELDING FERROUS METALS WITH D.C. WELDER TO PRODUCE A FLAT OUTSIDE CORNER JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Blueprint study.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., unit 5D, pp. 42-43.	Studying blueprint.	Completing written exercises, Bennet and Sly, p. 43.

TASK NO. 12: ARC WELDING FERROUS METALS WITH D.C. WELDER TO PRODUCE HORIZONTAL INSIDE CORNER JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Blueprint study.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., unit 5E, pp. 44-45. Althouse, Turnquist, and Bowditch, Modern Welding, Goodheart-Willcox Publishing Co., Inc., Chapters 5 and 6. Welding rig and equipment manual.	Studying blueprint, p. 44.	Completing written exercies, p.45.

TASK NO. 13: ARC WELDING FERROUS METALS WITH D.C. WELDER TO PRODUCE HORIZONTAL TEE JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Blueprint study.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., unit 6A, pp. 48-51. Althouse, Turnquist and Bowditch, Modern Welding, Goodheart-Willcox Publishing Co., Inc., Chapters 5 and 6.	Reading assignment Observing blueprint	Completing written exercises, pp. 50-51.

TASK NO. 14: ARC WELDING FERROUS METALS WITH D.C. WELDER TO PRODUCE A VERTICAL LAP JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Blueprint study.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y. unit 6B, pp. 52-53. Giachino, Weeks and Brune, Welding, Skills, and Practice, American Technical Society, Chicago, Illinois, Chapter 9.	Observing blueprint, p. 52.	Completing written exercises, p. 53.

TASK NO. 15: ARC WELDING PIPE STOCK WITH D.C. WELDER TO PRODUCE BUTT JOINTS WHILE FIXED

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Blueprint study.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., unit 17, pp. 114-116. Giachino, Weeks and Brune, Welding, Skills, and Practice, American Technical Society, Chicago, Illinois, Chapter 17.	Reading text, pp. 114-115. Observing illustrations, pp. 114-115. Completing written work, p. 116.	Group checking of written work.

TASK NO. 16: ARC WELDING PIPE STOCK WITH D.C. WELDER TO PRODUCE BUTT JOINTS WHILE ROLLING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note. See Task No. 1 for remaining information.	Blueprint study.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., unit 18, pp. 117-121. Kerwin, Harry, Arc and Acetylene Welding, McGraw-Hill Publishers, 1944, New York, N.Y., pp. 196-207.	Studying text, pp. 117-119. Studying illustrations, pp. 117-119. Completing written work, pp. 120-121.	Group checking of written work.

TASK NO. 17: PAD WELDING LOW AREAS ON METAL STOCK TO RENEW STOCK TO ORIGINAL HEIGHT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading equipment manual to determine equipment set up.	Reading assignment. Demonstration.	Equipment and it's instructional manual.	Reading manual for equipment to be used.	Teacher questioning.
Selecting correct type of electrode for size and type of metal to be welded. Selecting proper heat for type and thickness of metal being welded. Positioning work to be welded in most advantageous position for gravitational effects on appearance of bead. Identifying flux for removal with chipping hammer. Practicing proper safety precautions when using electric welding equipment: a. Wearing gogles or face shield. b. Wearing appropriate apparel. c. Maintaining equipment regularly. d. Shielding welding area.	Reading assignment. Discussing assignment in class. Demonstration.	Tools: Shield Gloves Welding rig Electrodes Assorted stock Textbooks: Jefferson and Woods, Metals and How to Weld Them, James F. Lincoln Arc Welding Foundation, Cleveland, Ohio, 1954, pp. 82-89. Rossi, Boniface E. Welding and its Application, McGraw-Hill Publishing Company, New York, N.Y., pp. 207-213. Kerwin, Harry, Arc and Acetylene Welding, McGraw-Hill Publishing Company, New York, N.Y., 1944, pp. 222-228.	Reading assignments. Participating in group discussion. Practice selecting electrodes and positioning.	Pupil administered self-checking quiz on assignment. Teacher observation.
Connecting electrical components on welder according to manual specifications. Clamping work to obtain fit up. Grounding work to obtain adequate conductance. Cleaning metal parts to be welded to obtain weld with necessary strength. Preheating weld area to bring metal to proper welding temperature. Striking an arc to join metals together. Running a bead on weld joint according to specifications. Stopping and restarting a bead for specific weld dimensions. Cleaning weld with chipping hammer and wire brush for additional welding or finished weld. Removing burrs from finished work with: a. File b. Abrasive cloth	Teacher, visiting specialist, or advanced student demonstrate the task exercise as specified on blueprint.	Welding equipment. Blueprints. Clamps. Wire brush. Grinder. Acetylene torch rig. Chipping hammer. Shield. Gloves. File. Abrasive cloth.	Watching the demonstration. Performing the assigned task.	Group comparison, evaluation and recording individual results.

Task No. 17 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Explaining the physical properties of the fusibility of various metals. Explaining the electron theory of current flow in welding.	Reading assignment. Film.	Rossi, Boniface E., Welding and Its Application, McGraw-Hill Publishing Company, New York, N.Y., 1941, pp. 214-238. Film: "The Principles of Electricity," General Electric Company.	Reading assignment. Observing film.	Completing comprehensive check list on assignment.

TASK NO. 18: GAS WELDING FERROUS METALS STOCK TO PRODUCE A FLAT BUTT JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine: a. Size and characteristic of workpiece. b. Type of weld required. c. Finish and accuracy required. d. Number of items to be welded. e. Kind of material.	Remedial - only as needed. Lecture. Demonstration.	Sample blueprints. Textbook: Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., unit No. 1.	Listen to lecture and read assignment.	Quiz from page 5 of Bennet and Sly.
Measuring stock with a rule or scale to determine length. Checking fit up with a rule and square to obtain an accurate assembly.	Remedial - only as needed. Demonstration. Filmstrip.	Tools: Steel rule. Square. Fillet gages. Rough stock. Textbook: Ludwig, Metalwork Technology and Practice, McKnight & McKnight Publishing Company, Bloomington, Ill., pp. 47-74. Althouse, Turnquist and Bowditch, Modern Welding, Goodheart-Wilcox Company, Inc., Homewood, Ill., unit 22. Filmstrip: "Laying Out," Society for Visual Education, 1345 Diversey Parkway, Chicago, Ill.	Observing demonstration and filmstrip. Reading assignment in Ludwig. Writing answers to questions in Ludwig, pp. 51,57,65,71.	Teacher-group discussion of assignment. Written quiz on filmstrip.
Applying knowledge of fractional parts of an inch: a. Multiplying fractions to determine exact dimensions. b. Adding fractions to determine exact dimensions. c. Dividing fractions to determine exact dimensions.	Remedial - only as needed. Pretest with remedial assignment if needed. Overhead projector lesson.	Teacher prepared test on fractions. Teacher prepared assignment on fractional problems. Overhead projector - Math Program #18 from V.P. Division of 3M Company.	Solve problems on pretest. Complete additional assignment if required. Observe overhead projector program.	Score pretest. Readminister pretest after remedial work is completed.
Selecting appropriate layout tools for the task. Selecting appropriate hacksaw blades for the task. Selecting grinder appropriate for the task.	Demonstration. Films.	Tools: Square. Scriber (talc) Steel rule. Hacksaw blades. Grinder Goggles Films: "Hacksaw," Proto Tools, 2209 Sante Fe Avenue, Los Angeles, Calif., "The Grinding Wheel," Norton Abrasive Company.	Observe demonstration and films.	Oral class discussion.

Task No. 18 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting proper wrenches for valve controls. Selecting proper welding rod for the task. Selecting appropriate welding tips for the task. Practicing proper safety precautions when using gas welding equipment: a. Wearing goggles or face shield. b. Wearing appropriate apparel. c. Inspecting equipment for leaks and valve regulation. d. Maintaining equipment regularly. e. Shielding welding area. f. Cracking cylinder valves. g. Handling tanks with proper care. h. Welding,eliminating flashbacks and backfires. i. Recognizing danger of using oil with oxygen. j. Turning off torch in proper sequence.	Demonstration and reading assignment. Film.	Tools: Valve wrenches. Torch tips. Assorted rods. Goggles and gloves. Gas welding rig. Textbook: Althouse, Turnquist, and Bowditch, Modern Welding, Goodheart-Wilcox Company, Inc., Homewood, Ill., Chapters 1 and 2. Film: "Oxyacetylene: Flamemaster of Metals," U.S. Bureau of Mines, University of Maryland, College Park, Maryland.	Observing demonstration. Reading assignment and answering questions on pp. 1-41,42 and 2-40. Viewing film.	Students check answers with prepared key.
Laying out stock with a: a. Square. b. Rule or scale. c. Combination square. d. Center head. e. Hemaphrodite calipers. f. Surface gage. g. Dividers. h. Trammel points. i. Scriber. j. Center punch. Cutting metal to dimensions with: a. Hand hacksaw. b. Power hacksaw. c. Power band saw. d. Gas cutting toch. Grinding stock to specific dimensions. Grinding bevel on heavy plate for adequate penetration. Cleaning metal parts to be welded to obtain weld of specific strength.	Lecture. Demonstration.	Tools: Tools as listed in column 1. Grinder. Blueprints. Stock to be layed out. Goggles. Gloves. Textbook: Althouse, Turnquist, and Bowditch, Modern Welding, Goodheart-Wilcox Company, Inc., Homewood, Ill., Chapter 3.	Observe demonstration. Practice laying out stock from blueprints.	Observe and check visually.

Task No. 18 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Clamping work to obtain fit up. Attaching regulators to tanks. Connecting hoses to regulators. Attaching welding tip to handle. Adjusting valves for desired working pressure. Lighting torch with spark lighter. Adjusting flame to correct heat. Running a bend with torch and filler rod.	Demonstration.	Tools: Clamps. Regulators. Hoses. Tanks. Spark lighter. Wrenches. Stock. Textbook: Giachino, Weeks and Brune, Welding, Skills, and Practice, American Technical Society, Chicago, Ill., pp. 221-224.	Observe demonstration. Read assignment.	Class discussion of safety practices. Observation of students at work.
Explaining the physical properties of the fusibility of various metals.	Remedial - as needed. Reading assignment.	Textbook: Rossi, Boniface E., Welding and Its Application, McGraw-Hill Publishing Company, New York, N.Y., 1954, pp. 214-238.	Reading assignment.	Written quiz on assignment.

TASK NO. 19: GAS WELDING FERROUS METALS STOCK TO PRODUCE A FLAT LAP JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job.	Blueprint study.	Bennet and Sly, unit 6C. pp. 54-55.	Observing blueprint, p. 54.	Completing written exercises, Bennet and Sly, p. 55.
Same information as Task 18.	Video Tape Viewing	Video Tape on oxy-acetylene welding equipment, setting up, safety practices, flame types for this task and demonstration on execution of task.	Viewing tape over closed circuit T.V. Recording appropriate notes on broadcast.	Group discussion on T.V. presentation. Compared with textbook assignments for Task No. 19.

TASK NO. 20: GAS WELDING FERROUS METALS TO PRODUCE A HORIZONTAL OUTSIDE CORNER JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Blueprint study.	Bennet and Sly, unit 7, pp. 56-61.	Reading assignment. Observing illustrations.	Completing written exercises, Bennet and Sly, pp. 60-61.

TASK NO. 21: GAS WELDING FERROUS METALS STOCK TO PRODUCE A HORIZONTAL INSIDE CORNER JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Blueprint study.	Bennet and Sly, unit 8A, pp. 66-67.	Studying blueprint, p. 66.	Completing written exercises, Bennet and Sly, p. 67.

TASK NO. 22: GAS WELDING FERROUS METALS STOCK TO PRODUCE A HORIZONTAL TEE JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Blueprint study.	Bennet and Sly, unit 8B, pp. 68-69.	Studying blueprint, p. 68.	Completing written exercises, Bennet and Sly, p. 69.

TASK NO. 23: GAS WELDING FERROUS METALS STOCK PRODUCE A VERTICAL LAP JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 1 for remaining information.	Blueprint study.	Bennet and Sly, unit 9A, pp. 72-77.	Studying blueprint, p. 72.	Completing written exercies, Bennet and Sly, p. 73.

TASK NO. 24: GAS CUTTING FERROUS METALS

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece. b. Type of cut required. c. Finish accuracy required. d. Number of items to be cut. e. Kind of material.	Blueprint study.	Bennet and Sly, unit 9B, p. 74-75.	Studying blueprint, p. 74.	Completing written exercises, p. 75.
Measuring stock with a rule or scale to determine length. Checking fit up with a rule and square to obtain an accurate assembly.	Remedial - only as needed. Demonstration. Filmstrip.	Tools: Steel rule. Square. Fillet gages. Rough stock. Textbook: Ludwig, Metalwork Technology and Practice, McKnight & McKnight Publishing Company, Bloomington, Ill., pp. 57-74. Althouse, Turnquist and Bowditch, Modern Welding, Goodheart-Wilcox Publishing Company, Homewood, Ill., unit 22. Filmstrip: "Laying Out," Society for Visual Education, 1345 Diversey Parkway Chicago, Ill.	Observing demonstration and filmstrip. Reading assignment in Ludwig. Writing answers to questions in Ludwig, pp. 51,57,65,71.	Teacher-group discussion of assignment. Written quiz on filmstrip.
Applying knowledge of fractional parts of an inch: a. Multiplying fractions to determine exact dimensions. b. Adding fractions to determine exact dimensions. c. Subtracting fractions to determine exact dimensions. d. Dividing fraction to determine exact dimensions.	Pretest with remedial assignment if needed. Overhead projector lesson.	Teacher prepared test on fractions. Teacher prepared assignment on fractional problems. Overhead projector - Math Program #18 from V.P. Division of 3M Company.	Solve problems on pretest. Complete additional assignment if required. Observe overhead projector program.	Score pretest. Readminister pretest after remedial work is completed.
Selecting appropriate layout tools for the task. Selecting appropriate hacksaw blades for the task. Selecting proper wrenches for valve controls. Selecting appropriate cutting tips for the task.	Reading assignment.	Giachino, Weeks and Brune, Welding, Skills, and Practice, American Technical Society, Chicago, Ill., pp. 268-275.	Reading assignment as indicated in column 2. Writing answers to questions in above assignment.	Individuals check answers with key.

Task No. 24 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Practicing proper safety precautions when using gas cutting equipment: a. Wearing goggles or face shield. b. Wearing appropriate apparel. c. Inspecting equipment for leaks and valve regulation. d. Maintaining equipment regularly. e. Shielding cutting area. f. Cracking cylinder valves. g. Handling tanks with proper care. h. Cutting, eleminating flashbacks and backfires. i. Recognizing danger of using oil with oxygen. j. Turning off torch in proper sequence.	Video tape. Demonstration. Reading assignment. Film.	Video tape on gas cutting. Tools: Valve wrenches. Torch tips. Assorted rods. Goggles and gloves. Gas welding rig. Textbook: Althouse, Turnquist and Bowditch, Modern Welding, Goodheart-Wilcox Company, Inc., Homewood, Ill., Chapters 1 and 2. Film: "Oxyacetylene: Flamemaster of Metals," U.S. Bureau of Mines, University of Maryland, College Park, Maryland.	Viewing video tape on gas cutting. Recording notes on taped demonstration.	Discussion, comparing video tape with above test assignment.
Laying out stock with a: a. Square. b. Rule or scale. c. Combination square. d. Center head. e. Hermaphrodite calipers. f. Surface gage. g. Dividers. h. Trammel points. i. Scriber. j. Center punch. Mounting stock in: a. Clamps. b. Vise.	Lecture. Demonstration. Reading assignment.	Tools: a. Tools as listed in column 1. b. Grinder. c. Blueprints. d. Stock to be layed out. e. Goggles. f. Gloves Textbook: Althouse, Turnquist and Bowditch, Modern Welding, Goodheart-Wilcox Company, Inc., Homewood, Ill., Chapter 3.	Observing demonstration. Reading assignment and answering questions on pp. 1-41,42 and 2-40. Viewing film.	Students check answers with prepared key.
Lighting torch with a spark lighter. Adjusting flame to correct heat. Cutting metal to dimensions with a gas cutting torch.	Demonstration. Reading assignment.	Tools: Oxyacetylene cutting equipment. Stock for practice cutting. Jam handy cutting filmstrip. Textbook: Giachino, Weeks, and Brune, Welding, Skills, and Practice, American Technical Society, Chicago, Ill., pp. 221-224.	Reading assignment as indicated in column 2. Studying illustrations on above assignment. Cutting with gas cutting equipment as per exercises assigned, Giachino, Weeks, and Brune, p. 276. Observing filmstrip as indicated in column 2.	Teacher observation of students application of the sense of the assignment. Group appraisal of completed individual exercises.

TASK NO. 25: BRAZING FERROUS METALS TO PRODUCE A FLAT BUTT JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine: a. Size and characteristics of the workpiece. b. Type of braze joint required. c. Finish and accuracy required. d. Number of items to be brazed. e. Kind of material.	Testing. (If results indicate need for review, refer to task No. 1.	Bennet and Sly, pp. 76-77.	Answer test questions.	Grade tests.
Measuring stock with a rule or scale to determine length. Checking fit up with a rule and square to obtain an accurate assembly.	Demonstration. Filmstrip.	Tools: Steel rule. Square. Fillet gages. Rough stock Textbook: Ludwig, Metalwork Technology and Practice, McKnight & McKnight Publishing Company, Bloomington, Ill., pp. 47-74. Althouse, Turnquist, and Bowditch, Modern Welding, Goodheart-Wilcox Publishing Company, Inc., Homewood, Ill., unit 22. Filmstrip: "Laying Out," Society for Visual Education, 1345 Diversey Parkway, Chicago, Ill.	Observing demonstration and filmstrip. Reading assignment in Ludwig. Writing answers to questions in Ludwig, pp. 51,57,65,71.	Teacher group discussion of assignment. Written quiz on filmstrip.
Applying knowledge of fractional parts of an inch: a. Multiplying fractions to determine exact dimensions. b. Adding fractions to determine exact dimensions. c. Subtracting fractions to determine exact dimensions. d. Dividing fractions to determine exact dimensions.	Pretest with remedial assignment if needed. Overhead projector lesson.	Teacher prepared test on fractions. Teacher prepared assignment on fractional problems. Overhead projector - Math Program #18 from V.P. Division of 3M Company.	Solve problems on pretest. Complete additional assignment if required. Observe overhead projector program.	Score pretest. Readminister pretest after remedial work is completed.
Selecting appropriate layout tools for the task. Selecting appropriate hacksaw blades for the task. Selecting grinder appropriate for the task.	Demonstration. Films.	Tools: Square. Scriber (talc) Steel rule. Hacksaw blades. Grinder. Goggles. Films: "Hacksaws," Proto Tools, 2209 Sante Fe Avenue, Los Angeles, Calif. "The Grinding Wheel," Norton Abrasive Company.	Observe demonstration and films.	Oral class discussion.

Task No. 25 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting appropriate wrenches for valve controls. Selecting proper brazing rod for the task. Selecting appropriate brazing tips for the task. Practicing proper safety precautions when using gas brazing equipment. a. Wearing goggles or face shield. b. Wearing appropriate apparel. c. Inspecting eqipment for leaks and valve regulation. d. Maintaining equipment regularly. e. Shielding brazing area. f. Cracking cylinder valves. g. Handling tanks with proper care. h. Eliminating brazing flashbacks and backfires. i. Recognizing danger of using oil with oxygen. j. Turning off torch in proper sequence.	Demonstration. Reading assignment. Practical work.	Tools: Wrenches. Brazing tips. Brazing rods. Welding rig. Supplier charts. Textbook: Althouse, Turnquist, and Bowditch, Modern Welding, Goodheart-Wilcox Publishing Company Inc., Homewood, Ill., p. 16-8; 24-1; 24-26; 2-27 to 2-28. Giachino, Weeks, and Brune, Welding, Skills, and Practice, American Technical Society, Chicago, Ill., pp. 214-216.	Observe demonstration of task. Read assignments. Practice setting up rig and operating torch.	Written quiz on reading assignment and/or observe students in practical situation.
Laying out stock with a: a. Square. b. Rule or scale. c. Combination square. d. Center head. e. Hemaphrodite calipers. f. Surface gage. g. Dividers. h. Trammel points. i. Scriber. j. Center punch. Cutting metal to dimensions with: a. Hand hacksaw. b. Power hacksaw. c. Power band saw. d. Gas cutting torch. Grinding stock to specific dimensions. Grinding bevel on heavy plate for adequate penetration. Cleaning metal parts to be brazed to obtain braze joint of specific strength. Clamping work to obtain fit up.	Lecture. Demonstration.	Tools: Tools as listed in column I. Grinder. Blueprint. Stock to be layed out. Goggles. Gloves. Textbook: Althouse, Turnquist, and Bowditch, Modern Welding, Goodheart-Wilcox Company, Inc., Homewood, Ill., Chapter 3. Ludwig, Metalwork Technology and Practice, McKnight & McKnight Publishing Company, Bloomington, Ill., pp. 93-96; 381-400.	Observe demonstration. Practice laying out stock from blueprints. Read assignment in Ludwig, pp. 93-96, 381-400.	Observe and check visually. Written quiz on reading assignment.

Task No. 25 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Attaching regulators to tanks. Connecting hoses to regulators. Attaching brazing tip to handle. Adjusting valves for desires working pressure. Lighting torch with spark lighter. Adjusting flame to correct heat. Running a bead with torch and filler rod.	Demonstration and practical work. Reading assignment.	Tools: Brazing outfit. Filler rod. Spark lighter. Textbooks: Althouse, Turnquist and Bowditch, Modern Welding, Goodheart-Willcox Company, Inc., Homewood, Ill., pp. 16-4, 16-9 to 16-10.	Observe demonstration of equipment set-up. Practice setting up equipment. Read assignment.	Written quiz on assignment.
Explaining the physical properties of the fusibility of various metals.	Remedial - as needed. Reading assignment.	Textbook: Rossi, Boniface E. Welding and Its Application, McGraw-Hill Publishing Company, New York, N.Y. 1941, pp. 214-238.	Reading assignment	Written quiz on assignment.

TASK NO. 26: BRAZING FERROUS METALS TO PRODUCE A FLAT LAP JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 25 for remaining information.	Blueprint study.	Bennet and Sly, unit 10, pp. 79-84.	Reading assignment.	Completing written exercises, p. 84-85.

TASK NO. 27: BRAZING FERROUS METALS TO PRODUCE A HORIZONTAL INSIDE CORNER JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine the specifications required for the job. Note: See Task No. 25 for remaining information.	Blueprint study.	Bennet and Sly, unit 11, pp. 86-88.	Reading assignment.	Completing written exercises, p. 88.

TASK NO. 28: BRAZING FERROUS METALS TO PRODUCE A HORIZONTAL INSIDE CORNER JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine the specifications required for the job. Note: See Task No. 25 for remaining information.	Blueprint study.	Bennet and Sly, unit 12, pp. 89-93.	Reading text. Observing illustrations.	Completing written exercises, pp. 93-95.

TASK NO. 29: BRAZING FERROUS METALS TO PRODUCE A HORIZONTAL TEE JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine the specifications required for the job. Note: See Task No. 25 for remaining information.	Blueprint study.	Bennet and Sly, unit 13, pp. 96-100.	Reading text. Studying blueprint.	Writing assignment answers, p. 100.

TASK NO. 30: BRAZING FERROUS METALS TO PRODUCE A VERTICAL LAP JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine the specifications required for the job. Note: See Task No. 25 for remaining information.	Blueprint study.	Bennet and Sly, unit 14, pp. 103-105.	Observing illustrations. Studying legends to above.	Completing written exercises, p. 105. Scoring above exercises.

TASK NO. 31: BRAZING NON-FERROUS METALS TO PRODUCE A FLAT BUTT JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading bluprint to determine: a. Size and characteristics of the workpiece. b. Type of braze required. c. Finish and accuracy required. d. Number of items to be brazed. e. Kind of material.	Blueprint.	Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., unit 19, pp. 122-124.	Studying text, pp. 122-123. Studying illustrations, pp. 122-123. Completing written work, pp. 124-125.	Group checking of written work.
Measuring stock with a rule or scale to determine length. Checking fit up with a rule and square to obtain an accurate assembly.	Demonstration. Filmstrip.	Tools: Steel rule. Square. Fillet gages. Rough stock. Filmstrip: "Laying Out," Society for Visual Education, 1345 Diversey Parkway, Chicago, Ill. Textbooks: Ludwig, Metalwork Technology and Practice, McKnight & McKnight Publishing Company, Bloomington, Ill., pp. 47-74. Althouse, Turnquist, and Bowditch, Modern Welding, Goodheart-Willcox Company, Inc., Homewood, Ill., unit 22.	Observing demonstration and filmstrip. Reading assignment in Ludwig. Writing answers to questions in Ludwig, pp. 51,57,65,71.	Teacher group discussion of assignment. Written quiz on filmstrip.
Applying knowledge of fractional parts of an inch: a. Multiplying fractions to determine exact dimensions. b. Adding fractions to determine exact dimensions. c. Subtracting fractions to determine exact dimensions. d. Dividing fractions to determine exact dimensions.	Remedial - if needed. Filmstrips.	S.V.E. filmstrips set (of 8) on fractions using those titles appropriate for problems encountered.	Viewing selected filmstrips. Executing prepared fundamental operations of fractions.	Administer a comprehensive achievement test on fractions.

Task No. 31 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting appropriate layout tools for the task. Selecting appropriate hacksaw blades for the task. Selecting grinder appropriate for the task.	Demonstration Film	Tools: Square Scriber (talc) Steel rule Hacksaw blades Grinder Goggles Films: "Hacksaws" Proto Tools, 2209 Santa Fe ave. Los Angeles, Calif. "The Grinding Wheel" Norton Abrasive Co.	Observe demonstration and films.	Oral class discussion.
Selecting proper wrenches for valve controls. Selecting proper brazing rod for the task. Selecting appropriate brazing tips for the task. Practicing proper safety precautions when using gas brazing equipment: a. Wearing goggles or face shield. b. Wearing appropriate apparel. c. Inspecting equipment for leaks and valve control. d. Maintain equipment regularly. e. Shielding brazing area. f. Cracking cylinder valves. g. Handling tanks with proper care. h. Brazing, eliminating flashbacks and backfires. i. Recognizing danger of using oil with oxygen. j. Turning off torch in proper sequence.	Demonstration Reading assignment Practical work	Tools: Wrenches. Brazing tips. Brazing rods. Welding rig. Supplier charts Textbooks: Althouse, Turnquist, and Bowditch, Modern Welding, Goodheart-Wilcox Publishing Company, Inc., Homewood, Ill., 2-27 to 2-28; 16-8,24-1,24-26. Giachino, Weeks, and Brune, Welding, Skills, and Practice, American Technical Society, Chicago, Ill.,pp. 214-216.	Observe demonstration of task. Read assignments. Practice setting up rig and operating torch.	Written quiz on reading assignment and/or observe students in practical situation.

Task No. 31 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Laying out stock with a: a. Square. b. Rule or scale. c. Combination square. d. Center head. e. Hemaphrodite calipers. f. Surface gage. g. Dividers. h. Trammel points. i. Scriber. Cutting metal to dimensions with: a. Hand hacksaw. b. Power hacksaw. c. Power band saw. d. Gas cutting torch. Grinding stock to specific dimensions. Grinding bevel on heavy plate for adequate penetration. Cleaning metal parts to be brazed to obtain braze joint of specific strength. Clamping work to obtain fit up.	Lecture. Demonstration.	Tools: Tools as listed in column I. Grinder. Blueprints. Stock to be layed out. Goggles. Gloves. Textbook: Althouse, Turnquist, and Bowditch, Modern Welding, Goodheart-Wilcox Company, Inc., Homewood, Ill. Chapter 3.	Observe demonstration. Practice laying out stock from blueprints.	Observe and check visually. Written quiz on reading assignment.
Attaching regulators to tanks. Connecting hoses to regulators. Attaching brazing tip to handle. Adjusting valves for desired working pressure. Lighting torch with a spark lighter. Adjusting flame to correct heat. Running a bead with torch and filler rod.	Demonstration and practical work. Reading assignment.	Tools: Brazing outfit. Filler rod. Flux. Spark lighter. Textbooks: Althouse, Turnquist, and Bowditch, Modern Welding, Goodheart-Wilcox Company, Inc., Homewood, Ill. pp. 16-4, 16-9 to 16-10.	Observe demonstration of equipment set-up. Practice setting up equipment. Read assignment.	Written quiz on reading assignment.
Explaining the physical properties of the fusibility of various metals.	Reading assignment.	Textbook: Jenning, Royalston F., Welding and Cutting, McKnight and McKnight, Bloomington, Ill., pp. 51-56.	Read assignment.	Written quiz.

TASK NO. 32: BRAZING NON-FERROUS METALS TO PRODUCE A FLAT LAP JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 31 for remaining information.	Blueprint study.	Bennet and Sly, unit 20, pp. 126-129.	Reading text, pp. 126-127. Observing illustrations, pp. 126-128. Completing written work, pp. 129.	Group checking written work.

TASK NO. 33: BRAZING NON-FERROUS METALS TO PRODUCE A HORIZONTAL OUSIDE CORNER JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 31 for remaining information.	Blueprint study.	Bennet and Sly, unit 21, pp. 130-133.	Reading text, pp. 130-131. Observing illustrations, pp. 130-131. Completing written assignment, pp. 132-133.	Group checking written work.

TASK NO. 34: BRAZING NON-FERROUS METALS TO PRODUCE A HORIZONTAL INSIDE CORNER JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 31 for remaining information.	Blueprint study.	Bennet and Sly, unit 22, pp. 134-138.	Reading text, p. 134. Observing illustrations, pp. 134-135. Completing written work, pp. 136-138.	Group checking written work.

TASK NO. 35: BRAZING NON-FERROUS METALS TO PRODUCE A HORIZONTAL TEE JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 31 for remaining information.	Blueprint study.	Bennet and Sly, pp. 139-145.	Completing test, pp. 139-145.	Group checking of test.

TASK NO. 36: BRAZING NON-FERROUS METALS TO PRODUCE A VERTICAL LAP JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
this task is identical to Task No. 31				

TASK NO. 37: INERT GAS WELDING FERROUS METALS TO PRODUCE A FLAT BUTT JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workpiece. b. Type of weld required. c. Finish and accuracy. d. Number of items to be welded. e. Kind of material. Reading equipment manual to determine equipment set up.	Lecture. Demonstration.	Sample blueprints. Equipment manuals. Textbook: Bennet and Sly, Blueprint Reading for Welders, Delmar Publishers, Albany, N.Y., unit 1.	Listen to lecture. Read assignment in text, Bennet and Sly, pp. 2-4.	Quiz from p. 5 of Bennet and Sly.
Measuring stock with a rule or scale to determine length. Checking fit up with a rule and square for accuracy.	Demonstration. Filmstrip.	Tools: Steel rule. Square. Fillet gages. Rough stock. Filmstrip: "Laying Out," Society for Visual Education, 1345 Diversey Parkway, Chicago, Ill. Textbooks: Ludwig, Metalwork Technology and Practice, McKnight & McKnight Publishing Company, Bloomington, Ill., pp. 47-74. Althouse, Turnquist and Bowditch, Modern Welding, Goodheart-Willcox Publishing Company, Inc., Homewood, Ill., unit 22.	Observing demonstration and filmstrip. Reading assignment in Ludwig. Writing answers to questions in Ludwig, pp. 51,57,65,71.	Teacher group discussion of assignment. Written quiz on filmstrip.
Applying knowledge of fractional parts of an inch: a. Multiplying fractions to determine exact dimensions. b. Adding fractions to determine exact dimensions. c. Subtracting fractions to determine exact dimensions. d. Dividing fractions to determine exact dimensions.	Pretest with remedial assignment if needed. Overhead projector lesson.	Teacher prepared test on fractions. Teacher prepared assignment on fractional problems. Overhead projector - Math Program #18 from V.P. Division of 3M Company.	Solve problems on pretest. Complete additional assignment if required. Observe overhead projector program.	Score pretest. Readminister pretest after remedial work is completed.
Selecting appropriate layout tools for the task. Selecting appropriate hacksaw blades for the task.	Demonstration. Films.	Tools: Square. Steel rule. Scriber (talc). 1/4" plate. Hacksaw blades. Grinder. Goggles. Assorted electrodes. Films: "Hacksaws," Proto Tools, 2209 Santa Fe Avenue, Los Angeles. "The Grinding Wheel," Norton Abrasive Company. Textbook: Giachino, Weeks, and Brune, Welding, Skills, and Practice, American Technical Society, Chicago, Ill., pp. 40-47.	Observe demonstration and films. Read; Ludwig, Metal Work Technology and Practice, McKnight and McKnight, Bloomington, Ill., Units 5,6,7,8,11,12.	Written quiz on assigned reading and on film.

Task No. 37 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting correct type of electrode for the task. Selecting type current to be used according to metal being used. Recognizing various sizes and types of welding tips.	Reading.	Textbook: Althouse, Turnquist, and Bowditch, Modern Welding, Goodheart-Wilcox Publishing Company, Inc., Homewood, Illinois.	Read assignment.	Quiz.
Positioning work to be welded in most advantageous position for gravitational effects on appearance of bead. Applying different angles in relation to type and thickness of metal. Standing in proper relation to work to be welded. Selecting appropriate file for task. Selecting appropriate abrasive cloth for task. Practicing proper safety precautions when using inert gas welding equipment. a. Wearing goggles or face shield. b. Wearing appropriate apparel. c. Maintaining equipment regularly. d. Shield welding area.	Remedial only as needed. Demonstration. Film. Practical work.	Tools: Files. Abrasive cloth. Chipping hammer. Welding rig. Electrodes. Shield. Textbook: Giachino, Weeks, and Brune, Welding, Skills, and Practice, American Technical Society, Chicago, Ill., Chapters 7 and 8. Film: "Inside of Arc Welding," (reel #1), General Electric Company, 1405 Locust Street, Philadelphia, Pa.	Observe demonstration and film. Practice safe welding techniques and using proper electrodes. Remedial.	Written quiz on film. Observe students at work.
Laying out stock with a: a. Square. b. Rule or scale. c. Combination square. d. Center head. e. Hermaphrodite calipers. f. Surface gage. g. Dividers. h. Trammel points. i. Scriber. j. Center punch. Cutting metal to dimensions with: a. Hand hacksaw. b. Power hacksaw. c. Power band saw. d. Gas cutting torch.	Lecture. Demonstration.	Tools: Tools and equipment as indicated in column I. Grinder. Blueprints. Stock to be layed out. Goggles. Gloves.	Observe demonstration. Practice laying out stock from blueprints.	Observe and check visually.

Task No. 37 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Installing consumable filler wire in mig welding equipment. Checking electrical connections for tightness. Setting up inert gas welding equipment according to welder manual. Checking inert gas fittings for tightness.	Reading.assignment. Demonstration.	Tools: Inert gas welder. Filler wire. Shield. Gloves. Textbook: Althouse, Turnquist and Bowditch, Modern Welding, Goodheart-Wilcox Publishing Company, Inc., Homewood, Ill., pp. 12-21; 11-1 to 11-6 and 12-1 to 12-29.	Reading assignments. Observe demonstration.	Written test on assignment.
Grinding stock to specific dimensions and weld angles. Clamping work to obtain fit up. Cleaning metal parts to be welded to obtain maximum strength from weld. Preparing tungsten electrode for type current to be used. Striking arc to begin welding process. Tacking fit up to relieve stresses. Running a bead on weld joint according to specifications. Removing burrs with: a. File. b. Abrasive cloth.	Demonstration. Practical work.	Tools: Clamps. Files. Abrasive cloth. Chipping hammer. Welding rig. Electrodes. Shield. Gloves. Welding equipment manual. Rough stock to weld. Textbook: Giachino, Weeks, and Brune, Welding, Skills, and Practice, American Technical Society, Chicago, Ill., pp. 19-24, 49-59. Althouse, Turnquist and Bowditch, Modern Welding, Goodheart-Wilcox Publishing Company, Inc., Homewood, Ill., pp. 11-8 to 11-22.	Observe demonstration. Read assignment in text. Practice connecting welder, welding, and cleaning weld.	Quiz on reading assignment. Observe students welding.
Explaining the physical properties of the fusibility of various metals.	Reading assignment. Film. Class discussion.	Textbook: Rossi, Boniface E., Welding and Its Application, McGraw-Hill Publishing Company, New York, N.Y., 1941, pp. 169-198. Film: "The Principles of Electricity," General Electric Company.	Read assignment in text View film Discuss assignment and film in class	Written test on assignment.

TASK NO. 38: INERT GAS WELDING FERROUS METALS TO PRODUCE A FLAT LAP JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 37 for remaining information.	Reading assignment.	Giachino, Weeks and Brune, p. 120.	Reading assignment. Studying illustrations.	Examine completed exercises.

TASK NO. 39: INSERT GAS WELDING FERROUS METALS TO PRODUCE A HORIZONTAL OUTSIDE CORNER JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 37 for remaining information.	Reading assignment.	Smith, "*Forging & Welding*" p112	Reading assignment. Executing practice joint.	Examine joint.

TASK NO. 40: INERT GAS WELDING FERROUS METALS TO PRODUCE A HORIZONTAL INSIDE CORNER JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 37 for remaining information.	Reading assignment.	Smith, "*Forging & Welding*" p112	Reading assignment. Executing practice joint.	Examine joint.

TASK NO. 41: INERT GAS WELDING FERROUS METALS TO PRODUCE A HORIZONTAL TEE JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 37 for remaining information.	Reading assignment.	Smith "Forging & Welding" p112	Reading assignment. Executing practice joint.	Examine joint.

TASK NO. 42: INERT GAS WELDING FERROUS METALS TO PRODUCE A VERTICAL LAP JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 37 for remaining information.	Reading assignment.	Smith, " Forging & Welding" p112	Reading assignment. Executing practice joint.	Examine joint.

TASK NO. 43: INERT GAS WELDING FERROUS PIPE STOCK TO PRODUCE BUTT JOINTS WHILE ROLLING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Running a bead on weld joint according to specifications. Note: See Task No. 37 for remaining information.	Reading Demonstrations	Althouse, Turnquist, Bowditch, p.11 - 11; Giachino, Weeks, and Brune, p.128.	Reading assignment Executing practice joints	Examine joint

TASK NO. 44: GAS WELDING FERROUS PIPE STOCK TO PRODUCE BUTT JOINTS WHILE FIXED

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 37 for remaining information.	Reading assignment.	Althouse, Turnquist, Bowditch, p. 11-11; Giachino, Weeks and Brune, p. 128.	Reading assignment. Observing demonstration and executing weld joint.	Examine joint.

TASK NO. 45: INERT GAS WELDING NON-FERROUS METALS TO PRODUCE A FLAT BUTT JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine: a. Size and characteristics of the workplace. b. Type of weld required. c. Finish and accuracy. d. Number of items to be welded. e. Kind of material. Reading equipment manual to determine equipment set up.	Lecture. Demonstration.	Sample blueprints. Equipment manuals. Textbook: Bennet and Sly, *Blueprint Reading for Welders*, Albany, N.Y., Delmar Publishing Company, unit No. 1.	Listen to lecture. Read assignment in text, Bennet and Sly, pp. 2-4.	Quiz from p. 5 of Bennet and Sly.
Measuring stock with a rule or scale to determine length. Checking fit up with rule and square for accuracy.	Demonstration. Filmstrip.	Tools: Steel rule. Square. Fillet gages. Rough stock. Filmstrip: "Laying Out," Society for Visual Education, 1345 Diversey Parkway, Chicago, Ill. Textbook: Ludwig, *Metalwork Technology and Practice*, McKnight & McKnight Publishing Company, Bloomington, Ill., pp. 47-74. Althouse, Turnquist, and Bowditch, *Modern Welding*, Goodheart-Willcox Publishing Company, Inc., Homewood, Ill., unit 22.	Observing demonstration and filmstrip. Reading assignment in Ludwig. Writing answers to questions in Ludwig, pp. 51,57,65,71.	Teacher group discussion of assignment. Written quiz on filmstrip.
Applying knowledge of fractional parts of an inch: a. Multiplying fractions to determine exact dimensions. b. Adding fractions to determine exact dimensions. c. Subtracting fractions to determine exact dimensions. d. Dividing fractions to determine exact dimensions.	Remedial - if needed. Pretest with remedial assignment if needed. Overhead projector lesson.	Teacher prepared test on fractions. Teacher prepared assignment on fractional problems. Overhead projector - Math Program #18 from V.P.Division of 3M Company.	Solve problems on pretest. Complete additional assignment if required. Observe overhead projector program.	Score pretest. Readminister pretest after remedial work is completed.
Selecting appropriate layout tools for the task. Selecting appropriate hacksaw blades for the task.	Remedial - if needed. Demonstration. Films.	Tools: Square. Steel rule. Scriber (talc). 1/4" plate. Hacksaw blades. Grinder. Goggles. Assorted electrodes. Films: "Hacksaws," Proto Tools, 2209 Santa Fe Avenue, Los Angeles. "The Grinding Wheel," Norton Abrasive Company. Textbook: Giachino, Weeks and Brune, *Welding, Skills and Practice*, American Technical Society, Chicago, Ill., pp. 40-47.	Observe demonstration and films. Read Ludwig, *Metalwork Technology and Practice*, units 5,6,7,8,11,12.	Written quiz on assigned reading and on film.

Task No. 45 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Selecting correct type of electrode for the task. Selecting type current to be used according to metal being welded. Recognizing various sizes and types of welding tips.	Reading assignment.	Textbooks: Althouse, Turnquist, and Bowditch, *Modern Welding*, Goodheart-Wilcox Publishing Company, Inc., Homewood, Ill., pp. 11-1 to 11-8. Giachino, Weeks, and Brune, *Welding, Skills, and Practice*, American Technical Society, Chicago, Ill.pp. 105-133.	Read assignments	Self-administered quiz
Positioning work to be welded in most advantageous position for gravitational effects on appearance of bead. Applying different angles in relation to type and thickness of metal. Standing in proper relation to work to be welded. Selecting appropriate file for task. Selecting appropriate abrasive cloth for task. Practicing proper safety precautions when using inert gas welding equipment: a. Wearing goggles or face shield. b. Wearing appropriate apparel. c. Maintaining equipment regularly. d. Shield welding area.	Lecture. Demonstration. Practical work. Film.	Tools: Files. Abrasive cloth. Chipping hammer. Welding rig. Electrodes. Shield. Textbooks: Giachino, Weeks, and Brune, *Welding, Skills, and Practice*, American Technical Society, Chicago, Ill., Chapters 7 and 8. Film: "Inside of Arc Welding," Reel #1, General Electric Company, 1405 Locust Street, Philadelphia, Pa.	Observe demonstration and film. Practice safe welding techniques and using proper electrodes.	Written quiz on film. Observe students at work.
Laying out stock with a: a. Square. b. Rule or scale. c. Combination square. d. Center head. e. Hermaphrodite calipers. f. Surface gage. g. Dividers. h. Trammel points. i. Scriber. Cutting metal to dimensions with: a. Hand hacksaw. b. Power hacksaw. c. Power band saw.	Lecture. Demonstration.	Tools: Tools and equipment as indicated in column I. Grinder. Blueprints. Stock to be layed out. Goggles. Gloves.	Observe demonstration. Practice laying out stock from blueprints.	Observe and check visually.

Task No. 45 (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Installing consumable filler wire in mig welding equipment. Checking electrical connections for tightness. Setting up inert gas welding equipment according to welder manual. Checking inert gas fittings for tightness. Belt sanding stock to specific dimensions and weld angles.	Reading assignment. Demonstration.	Textbook: Althouse, Turnquist and Bowditch, Modern Welding, Goodheart-Wilcox Publishing Company, Homewood, Ill. Tools: Inert gas welder. Filler wire. Shield. Gloves.	Read assignments. Observe demonstration.	Written test on assignment.
Clamping work to obtain fit up. Cleaning metal parts to be welded to obtain maximum strength from weld. Preparing tungsten electrode for type current to be used. Stricking an arc to begin welding process. Tacking fit up to relieve stresses. Running a bead on weld joint according to specifications. Removing burrs with: a. File. b. Abrasive cloth.	Demonstration. Practical work.	Tools: Clamps. Files. Abrasive cloth. Chipping hammer. Welding rig. Electrodes. Shield. Gloves. Welding equipment manual. Rough stock to weld. Textbook: Giachino, Weeks, and Brune, Welding, Skills, and Practice, American Technical Society, Chicago, Ill., pp. 19-24, 49-59.	Observe demonstration. Read assignment in text. Practice connecting welder, welding, and cleaning weld.	Quiz on reading assignment. Observe students welding.
Explaining the physical properties of the fusibility of various metals.	Reading assignment. Class discussion. Film.	Textbook: Rossi, Boniface E., Welding and It's Application, McGraw-Hill Publishing Company, New York, N.Y., 1941, pp. 169-198. Film: "The Principles of Electricity," General Electric Company.	Read assignment in text. View film. Discuss assignment and film in class.	Written test on assignment.

TASK NO. 46: INERT GAS WELDING NON-FERROUS METALS TO PRODUCE A FLAT LAP JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading blueprint to determine the specifications required for the job. Note: See Task No. 45 for remaining information.	Lecture. Demonstration.	Sample blueprint. Equipment manual. Textbook: Bennet and Sly, Blueprint for Welders, Delmar Publishing Co., Albany, N.Y., unit I.	Reading assignment. Take notes on teacher prepared forms.	Student self administered quiz on assignment.

TASK NO. 47: INERT GAS WELDING NON-FERROUS METALS TO PRODUCE A HORIZIONTAL OUTSIDE CORNER JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 45 for remaining information.	Lecture. Demonstration.	Sample blueprint. Equipment manual. Textbook: Bennet and Sly, Blueprint for Welders, Delmar Publishing Co., Albany, N.Y., unit I.	Reading assignment. Take notes on teacher prepared forms.	Student self administered quiz on assignment.

TASK NO. 48: INERT GAS WELDING NON-FERROUS METALS TO PRODUCE A HORIZONTAL INSIDE CORNER JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 45 for remaining information.	Lecture. Demonstration.	Sample blueprint. Equipment manual. Textbook: Bennet and Sly, Blueprint for Welders, Delmar Publishing Co., Albany, N.Y., unit I.	Reading assignment. Take notes on teacher prepared forms.	Student self administered quiz on assignment.

TASK NO. 49: INERT GAS WELDING NON-FERROUS METALS TO PRODUCE A HORIZONTAL TEE JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 45 for remaining information.	Lecture. Demonstration.	Sample blueprint. Equipment manual. Textbook: Bennet and Sly, Blueprint for Welders, Delmar Publishing Co., Albany, N.Y., unit I.	Reading assignment. Take notes on teacher prepared forms.	Student self administered quiz on assignment.

TASK NO. 50: INERT GAS WELDING NON-FERROUS ME[illegible] TO PRODUCE A VERTICAL LAP JOINT

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 45 for remaining information.	Lecture. Demonstration.	Sample blueprint. Equipment manual. Textbook: Bennet and Sly, Blueprint for Welders, Delmar Publishing Co., Albany, N.Y., unit I.	Reading assignment. Take notes on teacher prepared forms.	Student self administered quiz on assignment.

TASK NO. 51: INERT GAS WELDING NON-FERROUS PIPE STOCK TO PRODUCE BUTT JOINTS WHILE ROLLING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 45 for remaining information.	Lecture. Demonstration.	Sample blueprint. Equipment manual. Textbook: Bennet and Sly, Blueprint for Welders, Delmar Publishing Co., Albany, N.Y., unit I.	Reading assignment. Take notes on teacher prepared forms.	Student self administered quiz on assignment.

TASK NO. 52: INERT GAS WELDING NON-FERROUS PIPE STOCK TO PRODUCE BUTT JOINTS WHILE FIXED

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
Reading a blueprint to determine the specifications required for the job. Note: See Task No. 45 for remaining information.	Lecture. Demonstration.	Sample blueprint. Equipment manual. Textbook: Bennet and Sly, *Blueprint for Welders*, Delmar Publishing Co., Albany, N.Y., unit I.	Reading assignment. Take notes on teacher prepared forms.	Student self administered quiz on assignment.

OCCUPATIONAL INFORMATION UNIT FOR WELDING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
The employment outlook: 1. Local 2. National	Presentation of local employment officer. Overhead projector presentation.	Local statistics in duplicated form. Teacher-prepared transparencies from American Welding Society and Bureau of Labor Statistics.	Listening to presentation and discussing possibilities.	Write paragraph justifying vocational choice in light of presentation.
The wage scale: 1. Local a. union (1) apprentice (2) journeyman (3) master b. non-union (1) entry wages (2) experienced	Presentation by local union steward. Class conducted survey. Reading assignment Bulletin #145-91.	Teacher-prepared chart showing wages at different levels. Survey acquired information. Publication: Occupational Outlook Report Series, Employment Outlook for Welders, Oxygen and Arc Cutters, Bureau of Labor, Bulletin # 145-91, Government Printing Office, Washington, D.C.	Participating in teacher-conducted presentation of national situation.	Write paragraph comparing ones vocational choice locally and nationally.
2. National a. union (1) apprentice (2) journeyman (3) master b. non-union (1) entry wages (2) experienced	Reading assignment: Bulletin # 145-91.	Employment outlook for Welder, Oxygen and Arc Cutters, Bureau of Labor, Bulletin #145-91, Government Printing Office, Washington, D.C.	Attend indicated presentation. Participate in survey. Reading and discussing Department of Labor materials.	Short quiz day after presentation. Discussion of local and national rates.
The types of training available: 1. Apprenticeshop programs 2. Technical or trade schools 3. On-the-job 4. Military	Presentation by: Local employers, local vocational-technical representative, local recruiters.	Publication: Occupational Outlook Handbook, Department of Labor, 1966-67 edition, Government Printing Office, Washington, D.C., pp. 569-570.	Attend local industries presentation. Attend local vocational-technical presentation. Attend employer presentation. Attend recuriter's presentation.	Write short paper on which type training most suitable for self, considering local situation and family resources.
The working conditions experienced in the occupation.	Local journeyman presentation.	Publication: Occupational Outlook Handbook, Department of Labor, 1966-67 edition, Government Printing Office, Washington, D.C., pp. 569-570.	Attend presentation indicated at left.	Write up (briefly) pro's and con's of the welders working conditions.

OCCUPATIONAL INFORMATION UNIT FOR WELDING

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
The employment outlook: 1. Local 2. National	Presentation of local employment officer. Overhead projector presentation.	Local statistics in duplicated form. Teacher-prepared tranparencies from American Welding Society and Bureau of Labor Statistics.	Listening to presentation and discussing possibilities.	Write paragraph justifying vocational choice in light of presentation.
The wage scale: 1. Local a. union (1) apprentice (2) journeyman (3) master b. non-union (1) entry wages (2) experienced	Presentation by local union steward. Class conducted survey. Reading assignment Bulletin #145-91.	Teacher-prepared chart showing wages at different levels. Survey acquired information. Publication: Occupational Outlook Report Series, Employment Outlook for Welders, Oxygen and Arc Cutters, Bureau of Labor, Bulletin # 145-91. Government Printing Office, Washington, D.C.	Participating in teacher-conducted presentation of national situation.	Write paragraph comparing ones vocational choice locally and nationally.
2. National a. union (1) apprentice (2) journeyman (3) master b. non-union (1) entry wages (2) experienced	Reading assignment: Bulletin # 145-91.	Employment outlook for Welder, Oxygen and Arc Cutters, Bureau of Labor, Bulletin #145-91, Government Printing Office, Washington, D.C.	Attend indicated presentation. Participate in survey. Reading and discussing Department of Labor materials.	Short quiz day after presentation. Discussion of local and national rates.
The types of training available: 1. Apprenticeshop programs 2. Technical or trade schools 3. On-the-job 4. Military	Presentation by: Local employers, local vocational-technical representative, local recruiters.	Publication: Occupational Outlook Handbook, Department of Labor, 1966-67 edition, Government Printing Office, Washington, D.C., pp. 569-570.	Attend local industries presentation. Attend local vocational-technical presentation. Attend employer presentation. Attend recuriter's presentation.	Write short paper on which type training most suitable for self, considering local situation and family resources.
The working conditions experienced in the occupation.	Local journeyman presentation.	Publication: Occupational Outlook Handbook, Department of Labor, 1966-67 edition, Government Printing Office, Washington, D.C., pp. 569-570.	Attend presentation indicated at left.	Write up (briefly) pro's and con's of the welders working conditions.

OCCUPATIONAL INFORMATION UNIT FOR WELDING (continued)

AREA OF HUMAN REQUIREMENT	SUGGESTED TEACHING METHODS	SUGGESTED INSTRUCTIONAL MATERIALS	SUGGESTED STUDENT ACTIVITIES	SUGGESTED EVALUATION PROCEDURES
The physical and mental characteristics needed for qualification for employment.	Reading assignment.	Publication: Occupational Outlook Handbook, Department of Labor, 1966-67 edition, Government Printing Office, Washington, D.C. pp. 569-570. Opportunities in the Welding Industry, American Welding Society, 345 East 47th Street, New York 17, N.Y.	Reading and discussing indicated references.	Teacher-conducted oral discussion of candidates personal qualifications requirements.
The geographical location of employment.	Reading assignment.	Bureau of Labor Statistics Bulletins. Various State Department of Labor Statistics.	Reading and discussing indicated references.	Fill in prepared U.S. map, indicating areas of relative density of employment.
The opportunities for advancement.	Lecture.	Publication: Opportunities in the Welding Industry, American Welding Society, 345 East 47th Street, New York 17, N.Y. American Welding Society Bulletin, 345 East 47th Street, New York, 17, N.Y.	Sitting in on indicated presentations and discussions.	List and discuss necessary prerequisites for anticipated advancement.
The advantages and disadvantages: 1. Advantages 2. Disadvantages	Lecture. Student survey.	Teacher-prepared chart comparing advantages and disadvantages.	Attend lecture and participate in discussion.	Prepare permanent lists for self-use of advantages and disadvantages.
The nature of the work involved in the occupation.	Reading assignment.	Publication: Occupational Outlook Handbook, Bulletin #1450-41.	Read welders section.	Written (duplicated) quiz on job description.
The union involvement in the occupation.	Lecture by local union representative.	Tape recording of presentation by union representative. Tape recorder.	Attend lecture and participate in discussion.	Write up personal reactions to the trades union relationship.

INSTRUCTIONAL MATERIALS LIST

FOR

THE METAL FORMING AND FABRICATION CLUSTER

ASSEMBLY

Books

Clamps, Their History and Their Uses. Cincinnati: The Cincinnati Tool Company. 1957.

Giachino, J. W. and Schoenhals, Neil L. General Metal for Technology. Milwaukee: The Bruce Publishing Company. 1964.

How to Read, Use, and Care for Micrometers. Athol, Mass.: L.S. Starrett Company. 1958.

Ludwig, O. A. Metalwork Technology and Practice. Bloomington: McKnight and McKnight Publishing Company. 1962.

Occupational Outlook Handbook. U.S. Department of Labor. Washington, D.C. (latest edition).

Tools and Rules for Precision Measuring. Athol, Mass.: L. S. Starrett Company. 1961.

Tustison, F. E., Kranzusch, Ray F., and Blide, Dan C. Metalwork Essentials. Milwaukee: The Bruce Publishing Company. 1962.

Walker, John R. Modern Metalworking. Homewood, Illinois: Goodheart-Willcox Publishing Company. 1962.

MACHINING

Books

Benchwork. Albany: Delmar Publishers. 1961.

Blueprint Reading for Beginners in Machine Shop Practice. Albany: Delmar Publishers. 1963.

Drill Press Work. Albany: Delmar Publishers. 1961.

Johnson, Harold V. *General Industrial Machine Shop*. Peoria: Charles A. Bennett Company. 1959.

Lathe Work. Albany: Delmar Publisehrs. 1959.

Ludwig, O. A. *Metal Work Technology and Practice*. Bloomington: McKnight and McKnight Publishing Company. 1963.

Measurement. Albany: Delmar Publishers. 1959.

Porter, Lawshe, and Lascoe. *Machine Shop Operations and Setups*. Chicago: American Technical Society. 1957.

Shaper Work. Albanay: Delmar Publishers. 1960.

Shop Arithmetic. Albany: Delmar Publishers. 1959.

Wagner and Arthur. *Machine Shop Theory and Practice*. Albany: Delmar Publishers. 1957.

Whipple and Baudek. *Engine Lathe Operations*. Bloomington: McKnight and and McKnight Publishing Company. 1958.

Films

"Plain Turning"
16mm. b&w, 20 min.
South Bend Lathe Company
South Bend, Indiana

"The Metal Worker"
16mm., b&w, 29 min.
Modern Talking Pictures Service
1212 Avenue of the Americas
New York, N.Y.

"Tools and Rules for Precision Measuring"
16mm., b&w, 30 min.
Starrett Tool Company
Athol, Massachusetts

Filmstrips

"Basic Shop Safety"
Jam Handy
2821 E. Grand Boulevard
Detroit, Michigan

"Introduction to Machining"
Jam Handy
2821 E. Grand Boulevard
Detroit, Michigan

"Safety Practices in Metal Working - Engine Lathe"
Jam Handy
2821 E. Grand Boulevard
Detroit, Michigan

Charts

"Decimal Equivalents" and
"Tap and Drill Sizes"
Starrett Tool Company
Athol, Massachusetts

"Starrett Tool Charts"
Starrett Tool Company
Athol, Massachusetts

"Files"
McKnight and McKnight Publishing Company
Bloomington, Illinois

"Lathe Tool Bits"
McKnight and McKnight Publishing Company
Bloomington, Illinois

"Micrometer"
Starrett Tool Company
Athol, Massachusetts

SHEET METAL WORK

Books

Hand Processes. Albany, N.Y.: Delmar Publications. 1959.

Ludwig, O. A. Metal Work Technology and Practice. Bloomington: McKnight and McKnight Publishing Company (3rd edition).

Machining Processes. Albany, N.Y.: Delmar Publications. 1957.

Smith, Robert E. Forging and Welding. Bloomington: McKnight and McKnight Publishing Company. 1956.

WELDING

Books

Althouse, Turnquist & Bowditch. *Modern Welding.* Homewood, Illinois: Goodheart-Willcox Company, Inc. 1965.

Bennet & Siy. *Blueprint Reading for Welders.* Albany, N.Y.: Delmar Publishers.

Giachino, Weeks & Brune. *Welding, Skills, and Practice.* Chicago, Illinois: American Technical Society. 1965.

Griffin, Ivan and Roden, Edward M. *Basic Oxyacetylene Welding.* Albany, N.Y.: Delmar Publishing Company, Inc. 1960.

Jefferson, T.B. *Metals and How to Weld Them.* Cleveland, Ohio: James F. Lincoln Arc Welding Foundation. 1954.

Kerwin, Harry. *Arc and Acetylene Welding.* New York: McGraw-Hill Publishing Company. 1944.

Ludwig, Oswald A. and Ludwig, Earl A. *Metalwork Technology and Practice.* (latest edition). Bloomington, Illinois: McKnight and McKnight Publishing Company.

Rossi, Boniface E. *Welding and Its Application.* New York: McGraw-Hill Publishing Company. 1941.

Films

"Grinding Wheel"
Norton Abrasive Company
Norton, Massachusetts

"Hacksaws"
Proto Tools
2209 Santa Fe Avenue
Los Angeles, California

"Inside Arc Welding"
General Electric Company
1405 Locust Street
Philadelphia, Pennsylvania

"Oxyacetylene Flame"
Master of Metals
Bureau of Mines
University of Maryland
College Park, Maryland

"Principles of Electricity"
General Electric Company
1405 Locust Street
Philadelphia, Pennsylvania

Transparencies

"Fractional Numbers"
Set No. 18
Visual Products Division, 3M Company
2501 Hudson Road
St. Paul, Minnesota

Filmstrip

"Laying Out"
Set No. 18
Visual Products Division, 3M Company
2501 Hudson Road
St. Paul, Minnesota